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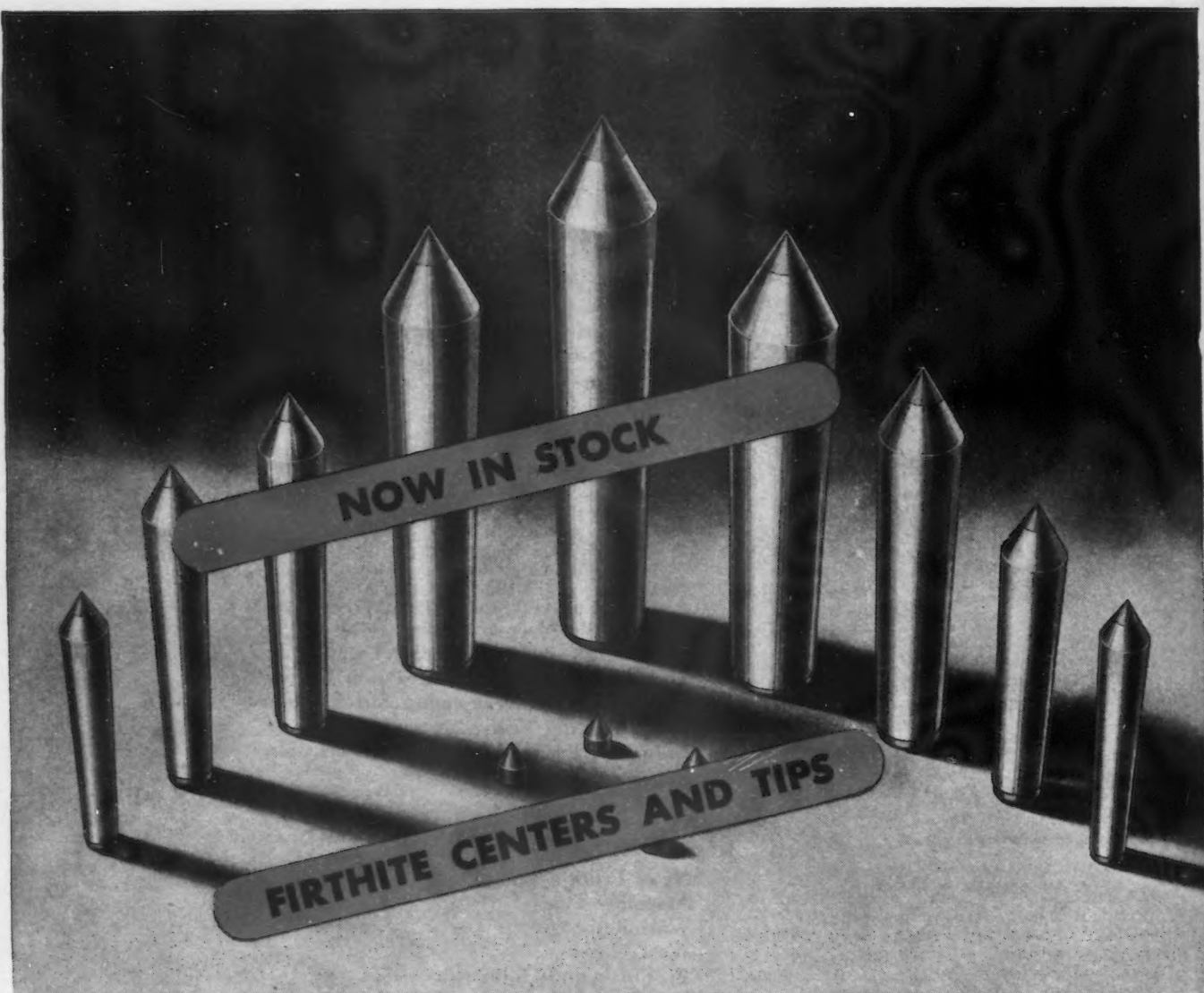
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Bombs and British Industry

(Cabled from London)

AFTER completing an interesting and intensive circuit covering industrial areas in the London, Birmingham and Sheffield districts, I am in a position to answer the question: "How much did bombing affect British industrial output?"

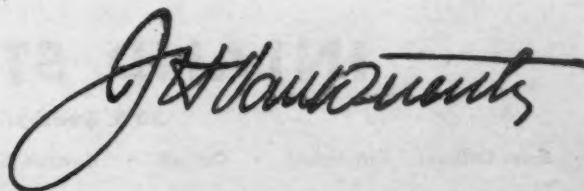
Surprising as it may seem, the damage to production, plants and equipment has been almost negligible. The same applies to railroad transportation and also in somewhat lesser measure to docks and warehouses.

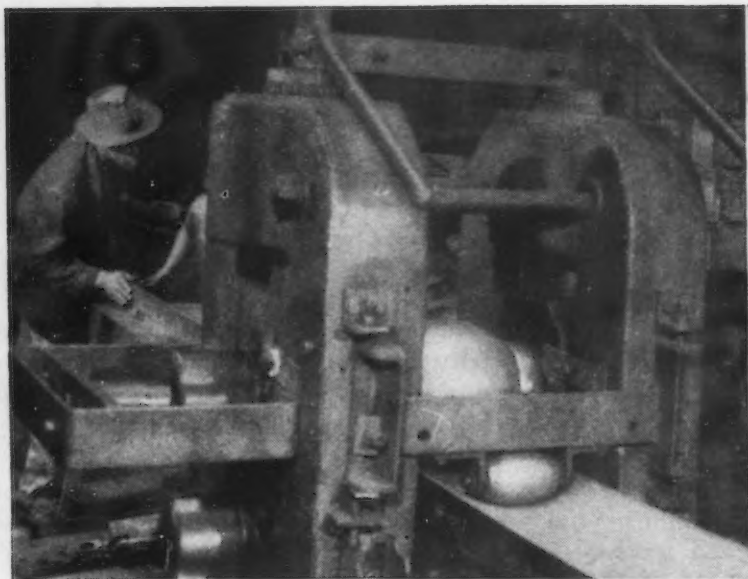
Whether caused by design or poor aim, the principal damage resulting from both the original blitz of high explosives in 1941-42 and the more recent and still occasional buzz bombing has been to churches and houses in the more congested areas. So far as industrial operations are concerned, I have as yet to find one instance of a plant or even a department having to suspend for more than a week and even this is the exception.

Some delays in production undoubtedly occurred in the days of the "round the clock" bombing because of the insistence that workers take shelter during an "immediate" but even this precaution became disregarded as familiarity bred contempt.

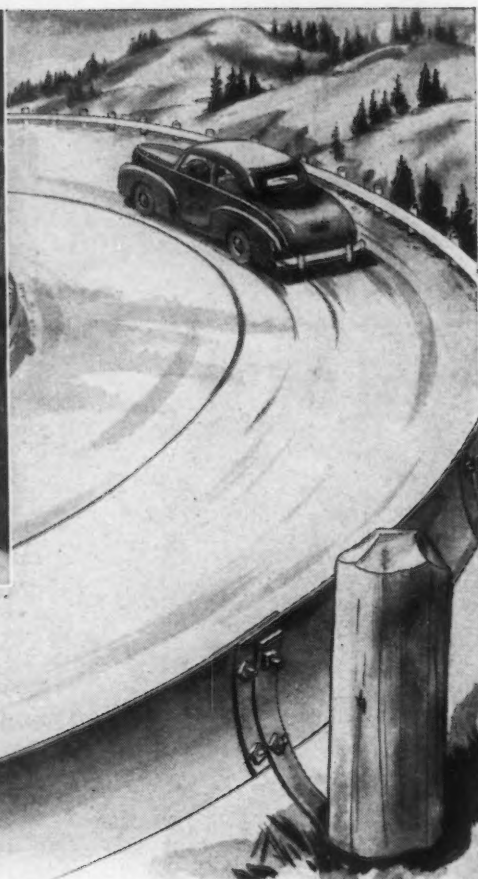
There are several theories attempting to explain why more damage to vital production was not done. One is that the Luftwaffe chose to cripple industry here by terrorizing workers through the destruction of their dwellings. Another is that Hitler thought England was "in the bag" and wanted to take over its industrial economy as a going concern and then use the islands as a springboard for the conquest of America.

Hitler, of course, missed the boat. The same mistake is not being made by our Allied Air Forces which have concentrated on industrial targets. However, the chief annoyance in hot metal plants here has been the blackout. It is difficult to ventilate a steel works at night with all windows covered. But it has been much better than to have both no ventilation and no plant to ventilate.





Each guard rail is cold rolled to form



Effective **HIGHWAY GUARD MADE OF INLAND STEEL**

Many miles of America's highways are made extra safe by hot rolled strip and flat bars rolled at the Inland mills. These steel products are fabricated by the Tuthill Spring Company, Chicago, into a type of highway guard that has great strength, cushions the shock of impact, has high visibility, and is easy to erect and maintain.

The guard rail is made of SAE 1045, 9 gage, 12 $\frac{5}{8}$ " wide hot rolled strip cut to 10 ft. or 12 ft. 6 in. lengths. These are multiple punched at one end and multiple slotted at the other end. Each

guard rail is then cold formed in one pass, through a two-high stand to give it curvature on a 12-in. radius, resulting in 1 $\frac{1}{2}$ in. depth of arc. Each rail is then cleaned by power driven wire brushes made to the contour of the rail. Finally, each guard rail is given a coat of paint. The brackets are formed from SAE 1095 spring steel bars, 4 in. by $\frac{1}{4}$ in. These brackets are heat treated for extra strength.

The remarkable life saving record of these highway guard rails is added proof of the uniform high quality of steel from Inland.

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► In addition to expanding its production facilities by the addition of at least one assembly plant and one new manufacturing plant, the Ford Motor Co. is renovating its sales structure. Efforts are being made to stabilize the dealer organization, raise its average quality level and modernize it for most efficient selling.

A new lower-priced car is contemplated. That it will carry the Ford nameplate indicates that if successful it will ultimately replace the standard series.

This aggressive policy on the part of Ford suggests that its moribund aspects so evident two or three years ago have been transformed into new determination.

► Despite an expected lower operating rate in the postwar period, WPB manpower officials are predicting that 10 per cent more steel workers will be employed than are working in the industry now.

This prediction is based in part upon the peacetime necessity for more workers in finishing operations which have been abandoned in wartime and in part upon a shortened work week.

► Buffalo, favorite guinea pig for the poll takers, has received word that it is no longer considered a critical manpower area. Authorizations have been granted 13 firms to convert immediately to civilian production. This is the first break in an area that has been almost completely devoted to war production for the past three years.

► The Germans claim that the B-29 Superfortress will be used by the Allies for a knock-out blow this winter. Quoting data from the Japanese the Superfortress is credited with a bomb load of about 11 tons.

► Russians have fitted loud speakers to aircraft, which cruise over German positions to blast them with propaganda. The British first used this technique in India to control native populations.

► There is so much gossip in Germany about the "V" weapons that authorities have had to take drastic steps to protect military secrets. Several soldiers working on launching platforms have been sentenced to death, and others have been imprisoned.

► Evidence accumulates that V-2 actually will be used if the war lasts into the Spring. The Germans say V-2 will be employed in the air, on land, and even launched from vessels at sea.

V-2 is stated to be a rocket shell of very large size, although the size varies according to use and method of launching. Responsible British sources claim that very large rocket shells are about completed, weighing 70 tons and carrying a 20-ton war head.

The British insist that this large rocket could be arched over to the U. S. through the stratosphere, and that such an attempt will be made if the Germans have time to build new and very heavy launching platforms.

A projectile of this size and range would easily be the War's most astounding chemical and metallurgical feat.

► Metal working machinery disposed of by the RFC in August brought over \$8½ million or 79 per cent of cost.

► One week after the British government gives the go ahead signal to civilian production, the Austin Co. expects to have Automobile chasses coming off its line at the rate of 400 a week. Within three months, the production rate of this company is expected to reach 1600 a week. The postwar model will be a modified 1939 product.

► Expansion of the rocket and heavy ammunition program of the Ordnance Department has necessitated construction of additions to existing munitions plants involving \$150,000,000. The new construction is already more than one-third completed.

► By spraying metal parts in an electrostatic field uneven distribution of the paint film is eliminated, resulting in an improved finish of uniformity and smoothness. Using higher potentials than in electroplating, 100,000 volts, paint particles acquire a charge as they enter the electrostatic field and are instantly attracted to the part being sprayed.

► Geneva has started its sixth open hearth this week which should increase its ingot production to over the estimated break-even point. Greatest obstacle to increased output is the shortage of male labor.



• • • KENT R. VAN HORN, president-elect of the American Society for Metals, and research metallurgist, Aluminum Co. of America.

Metal Congress

to a greater or less degree, most of them held in overcrowded hotel rooms and lobbies.

Traditional highlight of the ASM meeting, the Edward deMille Campbell memorial lecture, presented this year by G. R. Fitterer, dissected the topic, "Phase Equilibria in the Acid Open Hearth Process." Dr. Fitterer, head of the department of metallurgical engineering, University of Pittsburgh, compared the melting and refining of metals, which he termed "still an art," to heat treatment, which he said had become a science in recent years. He pointed out that "at the lower temperatures of heat treatment fewer experimental difficulties are encountered than at the high temperatures of liquid steels. Many attempts to apply the laws of physical chemistry to the acid openhearth steel processes have failed to clarify the mysteries of its operation."

"The usual physical chemical treatment of acid openhearth refining reactions involves a study of the thermo-dynamic properties of elements and compounds encountered in the steel making reactions and the subsequent determination of equilibrium constants for the slag metal reactions," he declared. "This treatment has failed to produce control methods or to clarify the operation of the acid openhearth."

"Instead of using thermodynamic methods, known equilibrium diagrams have been correlated to illustrate the changes occurring in the acid openhearth slag during the refining period. This treatment resulted in the explanation of the differences between acid openhearth practice in this country and Europe. It was shown that whereas some four to seven hours are required to refine 40 to 60 tons of steel by the acid process in Europe, only 2 to 2½ hours are needed in modern American practice. In some plants the refining rate is greater than one-half ton per min.

"An explanation of this improvement in American practice is possible by consideration of the equilibrium diagrams for the slag constituents. In addition the mechanism of oxidation in the acid openhearth process is easily understood if the phase diagrams are considered. A new theory

accounting in part for the oxidation of the steel during the refining period is proposed."

Dr. Fitterer described control procedure easily applied by melt-shop personnel which translates into practice the complicated background of factors involving equilibrium diagrams, fuel, dimensions of the furnace and materials charged. See more complete abstract, page 62.

National officers of ASM elected at the society's annual meeting are headed by a Cleveland, Dr. Kent R. Van Horn, research metallurgist, Aluminum Co. of America, who had been vice-president for the past year. Charles H. Herty, Jr., assistant to vice-president, Bethlehem Steel Co., was elected vice-president. William H. Eisenman, secretary of the society since its inception and largely responsible for its phenomenal growth, was reelected for a 2-year term. New trustees, elected for 2-year terms, are Lewis S. Bergen, associate director of metallurgy and research, Crucible Steel Co. of America, and Robert W. Schlumpf, metallurgical engineer, Hughes Tool Co. Arthur E. Focke, research metallurgist, Diamond Chain & Manufacturing Co., was appointed by the board of trustees to serve out the remainder of the unexpired term of Dr. Herty as trustee.

Heavy emphasis on the topic of hardenability in technical and group sessions gave added significance to presentation of the Albert Sauveur Achievement Award to Walter E. Jominy, chief metallurgist, Dodge-Chicago division of Chrysler Corp., developer of the end quench test bearing his name. Robert C. Stanley, president of International Nickel Co. of Canada, Ltd., who inaugurated a development and research department soon after rising to the company's presidency in 1922 and aided nickel's rise to an important place in the alloy hierarchy, won the ASM Medal for the Advancement of Research. The Henry Marion Howe Medal for the best paper to appear in ASM "Transactions" was awarded jointly to Earnshaw Cook, J. A. Fellows, and R. A. Flinn of American Brake Shoe Co. Herbert J. French, ASM president in 1942-43, received the past president's Medal. All awards were

LURED by the bait of the biggest National Metal Congress yet, minions of the metal working industry swarmed into Cleveland last week. They came away filled to the gills with the technical roe of the war years, better prepared to face the peace.

Approximately 40,000 people clicked the turnstiles of the Cleveland Public Auditorium to see displays occupying 167,000 sq. ft. of floor space and running the gamut of industrial processes. Attendance at technical sessions of the five participating societies was more selective, but topped previous records. The American Society for Metals, American Welding Society, American Institute of Mining and Metallurgical Engineers held their traditional annual programs, joined this year by the American Industrial Radium and X-Ray Society and the Society for Experimental Stress Analysis. By the time the public address systems were packed away, 163 papers and lectures and 31 round table or discussion type meetings had been carried to audiences. Next year's Congress will be held in either Detroit, Chicago, or Philadelphia, with final decision to be made later.

Not appearing on official programs, but nevertheless an integral part of the Congress were innumerable "bull sessions" affecting industrial progress

Previews Reconversion . . .

made at the annual dinner of the society.

Panel meetings, dealing with industrial problems, and featuring off the record discussion by leaders in the twenty fields covered, again were a focal point of interest. Attendance of operating personnel as well as technical men made audience discussion particularly fruitful.

Public attention throughout the country was drawn to assertions made by Victory Session speakers. Walter S. Tower, president, American Iron and Steel Institute, warned that the war created metal producing capacity of the country might not be fully utilized for many years following the peace. He pointed out that following World War I seven years was required to put steel production above the fifty million ton ingot war peak, and that the country prior to 1940 never had seen any period of consecutive years when it needed an average of as much as 60,000,000 tons. With output today at the ninety million ton level, he said that "neither growth of population nor increase in per capita consumption seems promising enough to bridge the wide gap between the old level of average demand and present potential supply."



• • • CHARLES H. HERTY, JR., vice-president-elect of the American Society for Metals.

Turning to the problem of drawing the war fangs of aggressor nations, the AISI head said "the question of access to and use of supplies of metals stands in the very front of any consideration of controls to be applied to those nations for ensuring peace." He declared that destruction of the German steel industry would at best be only a temporary measure.

"Over a span of 15 or 20 years, a new industry, modern and efficient to the last degree, could be built, and Germany would be ready to prepare for its third World War," he emphasized.

In his prepared paper, somewhat reduced in actual presentation, Maj. Gen. G. M. Barnes, chief, research and development service, Office of the Chief of Ordnance, U. S. Army, plotted steps necessary for an efficient postwar ordnance program. These included: (1) an ordnance department made up of professional ordnance officers and maintenance and strengthening of arsenals and proving grounds for the solution of technical problems; (2) a large corps of reserve ordnance technical officers constantly being trained in ordnance problems; (3) ample funds for research and development in order that contracts can be placed with arsenals and industry for continual development of new weapons; and (4) complete cooperation at all times with industries and all the great engineering societies and participation of ordnance officers in their activities.

"The ordnance department has more than 1000 research and development orders placed with American industry for the development of new and hitherto unknown weapons covering all ordnance fields," the general said. "The rate of production of new weapons at the moment is approximately 30 new items made ready for production per month."

Capt. T. A. Solberg, head, research and standards branch, shipbuilding division, Bureau of Ships, U. S. Navy, announced that, to extend the value of high voltage radiography, the Navy is now cooperating with the national defense research committee in developing and building a 20 million volt betatron machine. This unit will greatly reduce the time necessary to

radiograph heavy sections and will make possible sensitive radiography of much heavier material than formerly.

WITH topics ranging from mining through processing to fabrication, the annual fall meeting of the American Institute of Mining and Metallurgical Engineers attracted substantial crowds and wide interest during four days of program and business sessions at Cleveland from Oct. 16 to 19.

Two meetings were held on magnesium, two on creep of nonferrous metals and alloys, one on nonferrous production metallurgy, one on steel making, and another on recent developments in dilatometric analysis, along with two general sessions of the Iron and Steel Division and one of the Institute of Metals Division. Interspersed were business and committee meetings, and the annual dinner, at which the speaker was James F. Lincoln, president of Lincoln Electric Co., Cleveland.

THE American Welding Society, headquartered at the Hotel Cleveland elected new officers for the coming year. A. C. Weigel, the new presi-



• • • WILLIAM H. EISENMAN, re-elected secretary of the American Society for Metals.

dent, is the vice-president of Combustion Engineering Co., New York. Mr. Weigel has been active in the Welding Research Council, the Welding Society, the American Society of Mechanical Engineers, and is now the president of the American Boiler Manufacturers Association and Affiliated Industries.

Isaac Harter, first vice-president of AWS, is the vice-president of Babcock & Wilcox Co., at Barberton, Ohio. His activities have been basically around boiler construction and use, and he was associated with the beginnings of the ASME Boiler Code and with the acceptance by the Navy of welding for pressure vessels.

Dr. Wendell F. Hess, elected second vice-president, is associate professor in metallurgical engineering and head of the welding laboratory at Rensselaer Polytechnic Institute, Troy, N. Y. In addition to many responsibilities connected with the war effort, dealing with the various phases of welding in the war production program, Dr. Hess has been active in the AWS, the American Institute of Electrical Engineers, and the American Society for Metals. He was also the co-recipient of this year's Lincoln Medal for a paper, "Spot Welding of SAE 1020, 1035, and 1045 Steels in the 0.040-in. Thickness." This year he participated in the establishment of research programs under the Office of Production Research and Development of WPB, and is a consultant on welding problems to the American Bureau of Shipping.

O. B. J. Fraser, re-elected treasurer



• • • WALTER S. TOWER, president of the American Iron and Steel Institute, one of the speakers at the ASM Victory Sessions.

of the American Welding Society, is director of technical service on mill products for International Nickel Co., New York. He serves AWS as chairman of the Nickel Alloys Committee, and has served as a member of the executive committee and of the Committee on Outline of Work. His activities for the International Nickel Co. include welding service work on nickel, nickel-copper, and nickel-chromium iron alloys, and on steel clad with these alloys.

At the annual meeting of the

American Welding Society, there were several papers presented that were winners of the various awards. Dr. Wendell F. Hess, who prepared a paper jointly with Lt. D. C. Herrschaft, of the U. S. Army, won the Lincoln Medal and also the \$100 prize given by the Resistance Welder Manufacturers' Association for the paper "Spot Welding of SAE 1202, 1036, and 1045 Steels in the 0.040-in. Thickness." Duplicate awards were made to these co-authors for their work. Lt. Herrschaft, a graduate of Rensselaer, is now in the Army Air Forces, stationed at Childress, Texas.

Reginald B. Bland and Paul E. Sandorff were awarded in Resistance Welder Manufacturers' Association prize for their joint paper entitled "The Dynamic Properties of Flash-Welded Tubing." Both of these men are senior research engineers with Lockheed Aircraft Corp.

The Samuel Wylie Miller Memorial Medal and Certificate were awarded F. T. Llewellyn for his contributions to the structural welding field. Mr. Llewellyn, now retired, is former director of research for the United States Steel Corp.

For outstanding advisory service in the development of ordnance material, the Ordnance Distinguished Service Award was presented to the American Welding Society by Maj. Gen. L. H. Campbell, Jr., chief of ordnance. The presentation was made to David Arnott, president of the society, by Col. S. B. Ritchie, from the office of the chief of ordnance.

• • • A. C. WEIGEL, president, A.W.S., and vice-president of Combustion Engineering Co., New York.



• • • ISAAC HAARTER, first vice-president, A.W.S., and vice-president of Babcock & Wilcox Co., Barberton, Ohio.



• • • WENDELL F. HESS, second vice-president, A.W.S., and co-author of the paper that won the Lincoln Medal and the Resistance Welder Association prize.



A.I.M.E. Examines Research Data

DETERMINATION of the basicity of open hearth slags by a new and sufficiently accurate method which appears to be speedier than previous means was outlined to the meeting in a paper prepared by W. O. Philbrook, A. H. Jolly, Jr., and T. R. Henry of Wisconsin Steel Works. The paper, presented by Philbrook, was entitled "A Rapid Laboratory Method for Estimating Basicity of Open Hearth Slag."

The principle underlying this new method is the well known fact that when burnt lime or slaked lime is shaken in water it dissolves to at least minor degree and produces an alkaline reaction. Alkalinity can then be measured by titrating. If the reactions are quite mild, they can be determined by immersion into the solution of some type of electrode, such as the vacuum tube "glass electrode," in which the very faint electromotive force is measured through the high resistance of glass membrane.

The procedure outlined by the authors is admittedly not perfect, but it was pointed out that no other method is either. Error incidence was reported about the same as in other means. Final determination of basicity, of course, goes into the hands of the laboratory technician rather than the furnace operator, but location of the lab near the furnace could be partial compensation for this disadvantage, if such it is. However, the method has the favorable aspect of eliminating human judgment factors in favor of mechanically reached conclusions, and also has the virtue of being quickly installed and operable in comparatively unskilled hands.

In brief, the method of testing starts with the spooning of slag from the furnace and pouring into a pancake mold, preferably in thin section for quick cooling. Naturally a representative sample is wanted, one without lumps of undissolved constituents. After cooling a lump is crushed until all particles pass a 40-mesh screen. Metallic iron is removed and the powder thoroughly mixed. About 100 ml. of water is placed in a 250 ml. Erlenmeyer flask, to which about 200 mg. of slag



powder is added by rough spoon measurement. The flask is stoppered, shaken intermittently, and allowed to stand for 10 min. The pH meter is checked for customary adjustments and temperature compensation and the temperature of the slag suspension is adjusted to 75 to 80 deg. F. After the glass electrode and sample cup are rinsed twice with the extract the pH reading is taken. The lime-silica ratio of the slag is obtained by reference to a correlated curve or table obtained from numerous pH measurements of analyzed samples, taken under standard conditions on slags less than one day old.

It was found that as the weight of —40 mesh powder suspended in 100 ml. of water was increased from 5 to 200 mg., the pH values increased,

but beyond 200 mg. there was no gain of significance. Hence, measurement can be rough as long as it approximates a 200 mg. minimum. As regards time of standing, it was determined that virtually the full pH reading is obtainable after about 10 min. of shaking, and that further standing did not vary the result to any significant degree. The simple expedient of stoppering the flask during the standing period eliminated any possible absorption of carbon dioxide from the air. Ordinary distilled water can be used for the work.

Increasing of temperature of the solution appeared to have the effect of decreasing pH at a rate of 0.016 pH per deg. C in a range close to 25 deg. C. Recommendation is made, therefore, that readings be held rather close within a 75 to 80 deg. F. range.

Finally the technicians established that there was no consistent drift in pH in slags pulverized intermittently up to 10 days after pouring. This was notable, for it obviously permits the use of the process for study several days after the heats have been produced.

o o o

Magnesium Casting Quality Examined

AS quality in magnesium castings becomes constantly more important, problems of microshrinkage and grain size have been under increased study. These twin headaches for metallurgists, designers and manufacturers were discussed in a paper by Oscar Blohm, chief metallurgist, and B. H. Havens, of the metallurgical staff, of Hills-McCanna Co., Chicago, dealing with "Factors that Affect the Physical Properties of Magnesium Sand Castings" of ASTM 4 and ASTM 17 Alloys.

Fine grain size, said Blohm in reading the paper, does not necessarily result from recommended superheating. A standard schedule does not produce fine grain metal consistently. Because it is impossible to judge beforehand what superheating each crucible needs to produce a certain grain size, foundries are obliged to

adopt a "standard" superheating practice and hope for the best. Further, grain size in any one casting varies, depending on section thickness.

As for microshrinkage, it was stated that pouring temperatures of castings must be established by trial in order to reduce amount and degree. Some must be poured always at low temperature, and these will nearly always have a coarser grain than others poured at high temperature, regardless of superheating prior to pouring. It was opined that a sound casting with somewhat coarse grain is preferable to a fine grain casting containing appreciable microshrinkage.

A routine test procedure is followed at Hills-McCanna, including physical testing of bars from every heat, X-ray examination and daily grain

size determinations on all production material, chemical analysis of every heat, and fracture tests for visual examination. Whenever any substandard condition is revealed, further metallographic investigation takes place, including compound, porosity and precipitate rating, as well as grain size count and X-ray correlation of porosity rating.

Observations derived from these test bar failures and related data have led to six tentative conclusions, as follows:

1—Grain sizes up to 0.02 in. can meet present physical requirements as set forth in ASTM, AMS, and Army-Navy specifications covering the sand cast magnesium alloy castings. 2—Microshrinkage, or porosity, has a more deleterious effect on physical properties than has coarse grain up to the limits mentioned above. 3—The distribution of microporosity in

a test bar is the most critical factor in determining bar failures. General distribution is more effective for a given porosity rating as a cause of bar failure. 4—The frequency of bar failure in the grain size range 0.02-0.04 in. becomes prohibitive (63.6 per cent) while due to porosity it becomes fatal at a rating of number 7. 5—If any failure to perform in service occurs, examination must be made of possibilities other than the two factors discussed above. While there is no suggestion of any specific cause, one possibility which must be considered is the design of the part. 6—It is well to remember that the optimum in physical properties and service can be obtained with a combination of fine grain and a minimum of porosity. These are attainable goals when close cooperation between designer, foundry and ultimate consumer prevails.

o o o

Core Sand Mixtures for Magnesium

DETAILED discussion of experiments with core-sand mixtures for magnesium castings at the Lockland, Ohio, plant of Wright Aeronautical Corp. were described by O. Jay Myers, metallurgist of that plant, in his paper, "Oxidation Inhibitors in Core Sand Mixtures for Magnesium Castings."

For this work, a typical heavily bonded blow machine core sand mixture was used, compounded as follows: 1000 lb. round grained Ottawa-type silica sand (G.F.N. 62-65); 12 lb. cereal binder; 12 pt. low-baking temperature core oil; and 1.5 per cent moisture. A small mold pattern was constructed to provide necessary cores for a hollow, truncated conical casting, 8 in. high, 3 in. diameter base and 1½ in. diameter top, enveloping a pencil core of 1 in. diameter. Pouring was vertical, the gate entering the small section with the risers taken off the large section.

Facing sand in the mold was mulled in 25 lb. batches, mixing time being 2 min. dry, 3 min. with water and 3 min. with oil. Cores were hand rammed and baked in a laboratory gas fired oven for 3 hr. at 350 deg. F. Tensile briquettes accompanied each mold in the oven.

A standard method was worked out to pour the castings from production superheating pots, pouring being in a temperature range between 1350 and 1375 deg. F. Cooled castings were knocked out and sandblasted; sprues and risers were cut off by bandsaws,

after which the castings were sawed lengthwise. Half of each casting was cleaned on an abrasive wheel, then X-rayed, while the other half was fractured. Twenty sand mixtures were made, each of which contained a different proportion of inhibitor added to the basic formula.

The conclusion of these experiments was that a combination of sulphur and boric acid was better than the use of either singly. Experimental production runs have been made lowering total percentage of these agents to one per cent, with excellent results.

The first mixture, tried without inhibitor, resulted in a casting with heavy burned skin. Burned sand clung to the casting at knockout. Numerous pits were revealed on the casting surface, and radiographs showed internal burning. Metallographic examination revealed heavy interstitial burning.

o o o

Processing of Beryllium

THE history and processing of beryllium was treated in a survey type of paper, "Beryllium," presented to the meeting by Donald M. Liddell, New York consultant. His discussion of processes of reducing beryl, $3\text{Be} \cdot \text{Al}_2\text{O}_3 \cdot 6\text{SiO}_2$, to Be tended to confirm the statement quoted from Dr. C. B. Sawyer, that it is "the world's No. 1 metallurgical headache."

When 0.5 per cent sulphur by weight of the sand was added, similar properties were manifested in the casting, but in reduced measure, indicating still inadequate protection. As sulphur was added in increasing amounts it was found that a 2.5 per cent addition brought definite improvement, reducing severe burning to a minimum, but leaving the surface covered with charred sand and binder. At a 5 per cent level of sulphur addition, tensile strength and green compression of the sand mixture were reduced, and the casting was not improved.

Boric acid was then tried. With 0.5 per cent addition, the casting was as satisfactory as its predecessors. It broke free from the mold at knockout, showed only slight surface discoloration, no pits at surface, no serious internal burning, and reduced porosity. When increasing amounts of boric acid were added, tensile strength of the baked sand mixture dropped, while green compression became slightly greater. Castings remained unchanged. A satisfactory casting was produced with 2.5 per cent boric acid added, but gas emanated from the risers at pouring. With 5 per cent the casting was unsatisfactory.

The next series of attempts used both sulphur and boric acid. A satisfactory result was achieved with 0.5 per cent of each ingredient in the sand; and with higher amounts similarly satisfactory results came about, except where 2.5 per cent of each agent was used. As inhibitor percentages increased, however, the physical properties of the sand dropped far below optimum workability.

Using 0.5 per cent of ammonium silicofluoride, the casting was as well protected, but green compression and tensile strength of the sand was lowered. Diethylene glycol, 0.5 per cent added, gave some protection to the casting, leading to the possibility that combining it with a low baking temperature core oil might prove profitable.

o o o

"Metallurgy of this element," the speaker stated, "is a perplexing problem because the metal has a high fusion point and a high vapor pressure at a temperature not much above the fusion point; the pure metal is exceedingly light and has a tendency to float on slags and on fused electrolytes; the halides are all highly deliquescent and after they have ab-

Modern processes described by the author are largely based on bringing beryllium into solution as an alkaline fluoberyllate, this method having been initiated by H. Copaux in his French patent, No. 476475, issued in 1915. Alternately the beryllium is dissolved as beryllium sulphate or chloride. All such processes spring from the fact that alkaline fluoberyllates are soluble in water, while beryllium fluoride is not.

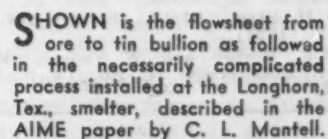
Sodium hydroxide is added, making the mixture exactly neutral and purifying it from iron, manganese and alumina; and potassium permanganate is added. The iron-manganese-alumina precipitate is filtered off, and an excess of sodium hydroxide is added. Beryllium hydroxide is precipitated, filtered off, washed and dried. After drying the material is ground in a paint mill with acid ammonium fluoride, which converts the hydroxide to ammonium-beryllium fluoride. This is then briquetted and heated sufficiently to drive off the ammonium fluoride, leaving pure beryllium fluoride behind, which is then reduced with magnesium or a magnesium alloy in the presence of some of the metal desired for a master alloy.

Several electric furnace processes for reduction of beryllium have been developed and patented in the United States in recent years. L. Burgess produced beryllium carbide or beryllium silicide, distilling off beryllium chloride. By reduction, tetraberyllium trisilicide was formed, and by formation of ferrosilicon in the furnace he worked on a means of con-

Beryl, which at its purest contains about 14 per cent of beryllium oxide is the only beryllium mineral warranting commercial attention. It is found in Brazil, Argentina, India, Canada and Portugal. The richest mineral in this respect, however, is phenacite— $(\text{BeO})_2\text{SiO}_3$ —or beryllium orthosilicate, which contains 45.55 per cent beryllium oxide but which is rather rare.

COMPLEX tin ores have increased a great deal in commercial importance since the Japanese invasion of the Malay States and the Dutch East Indies have forced reliance on Bolivian and Mexican mines to provide the United States with its tin supply, and complications in

Ore dressing processes have had to be developed for stannite, cylindrite,
(CONTINUED ON PAGE 118)





GEORGE R. FITTERER
Nineteenth Campbell Lecturer

Control of the Acid Open

By G. R. FITTERER

Head of Department of Metallurgical
Engineering, University of Pittsburgh

Abstract — 1944 Campbell Memorial Lecture.

TODAY, the acid furnace is annually responsible for from two to three million tons of large forgings and castings which are required by Government and industry. Most of the steels so produced are medium-carbon and low-alloy types, whereas many semi-steels or high-carbon irons are also made. Large caliber guns, marine crankshafts and connecting rods, shafts for steam turbines, locomotive parts, roll housings and rolls are examples of its products.

Great strides have been made in this country in the past several years to reduce the refining time in the acid hearth to an exceptionally low figure. Many heats are produced with no more than a 2-hr. period from the time the heat is completely melted until it is tapped. No losses of nickel or molybdenum are encountered. These alloying elements are retained from remelted scrap and may be charged or added at any time during the heat. Chromium losses are nominal and considerable amounts of chromium may be retained from the remelted scrap. These factors should be placed on the credit side of the ledger for the acid open-hearth and are some of the reasons for its continued use.

On the debit side are usually placed

the facts that, first, a low phosphorus and sulphur charge must be used; and, second, it is generally considered undesirable to use light scrap because of the high formation of iron oxide and the subsequent erosion of the acid or silica lining of the furnace.

This short refining period is partially accomplished by using a low percentage of pig iron in the charge, and the low sulphur and phosphorus requirements of the pig iron are minimized somewhat in this manner. The scrap, however, must still be low in these elements. The use of light scrap in the acid open-hearth is quite common today, although heavy and medium scrap are to be preferred.

The statement has been made by many previous investigators that the acid open-hearth operates closer to equilibrium than any other steel making process. Unfortunately, this statement has never been clarified by a qualifying clause, indicating specifically which phase of the process is at equilibrium. One objective of this paper is to seek a justification for this conclusion and to specify which equilibrium, if any, the acid open-hearth approaches.

A critical survey of the available physical chemical data has been made by the author in order to determine their usefulness to the acid open-hearth industry. This paper deals specifically with a search for the equilibrium which the acid open-hearth reputedly approaches as so many previous investigators have stated.

In the acid open-hearth there are both heterogeneous and homogeneous reactions to be considered since there are four phases involved: the solid (or the SiO_2) lining, the gas, the slag, and the metal bath. Strictly speaking, practically all of the reactions occurring in the process are heterogeneous in nature or are dependent

upon other heterogeneous side reactions.

Most of the previous investigators have been concerned with the competing reactions of carbon, manganese and silicon with iron oxide in the metal bath. Practically all of these studies have involved attempts to explain the sources of iron oxide for purposes of these reactions. It is generally assumed that the oxygen is furnished to the metal by the slag and that the iron oxide is distributed between the slag and metal in accordance with a distribution ratio. However, where the previous investigators attempted to explain the activity or the state in which the FeO is in the slag, they encountered a maize of contradictory data and found it necessary to resort to an arbitrary assumption in this regard.

For example, many excellent investigations such as those of Schenck,¹ Styri,² as well as Körber and Oelsen³ centered on the assumptions that iron oxide existed in the liquid slag as a definite chemical compound or ferrous silicate. This was dissolved in SiO_2 according to these authors and dissociated to some extent so that the slag was essentially composed of "free" FeO , "free" SiO_2 and some undecomposed silicate. The "free" FeO in turn diffused into the metal bath where it reacted with carbon and the other metalloids.

This procedure would be highly useful if it were not necessary to assume a value for the dissociation constant of the silicate.

There seems to be no ready and reliable experimental method for the verification of the assumed dissociation constants and none of this information promises to develop practical control methods in the very near future. Inasmuch as this is the aim of the present investigation all of the

(1) H. Schenck and E. O. Brüggeman. Arch. f. d. Eisenhüttenw., 9, p. 543. (1936).

(2) H. Styri. J.I.S.I. (London 108, II, p. 189. (1923).

(3) F. Körber and W. Oelsen. Mitt. K.W.I. Eisenforsch. 14, No. 13, p. 181. (1932).

Hearth *By Means of Slag Fluidity Test*



previous data concerning the physical chemistry of the acid process will be reserved for future study. Instead, other methods for control have been sought and this led the author to a study of heterogeneous equilibria or phase diagrams.

From a study of phase diagrams it would appear that the acid open-hearth tends to approach a state of dynamic equilibrium, although it is unlikely that any heats reach that hypothetical state. However, it is apparent now, that the acid slag continuously approaches a saturated state with respect to SiO_2 content. The reason that saturation is difficult to attain is that in usual American practice, the temperature is constantly increasing throughout the heat.

With increased temperature two phenomena may occur. First, since increased temperature demands a higher SiO_2 content of the slag for saturation, some SiO_2 may be absorbed from the furnace walls particularly by that portion of the slag which is in the proximity of the banks.

The slag in the center of the furnace, however, may approach saturation in a converse manner. Study will reveal that whereas an increased percentage of SiO_2 is required for the saturation of the slag at relatively higher temperatures, this may be accomplished not only by an increase in SiO_2 but by a loss of FeO content as well. In other words, less FeO is required at relatively higher temperatures to saturate the silica and hence as the temperature increases it becomes free to react with the metalloids of the bath.

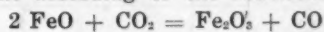
Apparently both an increase in SiO_2 in the slag near the banks and a "precipitation" of FeO content in the center of the furnace occur simultaneously in most heats. The release of FeO for reaction with the metalloids undoubtedly accounts for part of the oxidation. However, a study of the oxygen balance of various heats indicates that this procedure may represent about 16 per cent of the total oxidation.

For this reason, an oxygen balance has been made on a recent heat. A total of 0.49 carbon, 0.11 manganese and 0.04 silicon were removed during the refining period. On the basis of

the 81,620 lb. charged, this represents a total of 2675 lb. of FeO required for the removal of the metalloids.

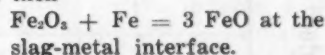
FeO "precipitated" from the slag was calculated to be 449 lb.; FeO from ore additions, 304 lb., and available FeO "freed" by limestone, 576 lb. This leaves the per cent FeO still unaccounted for at 1346 lb. This would indicate that approximately one-half of the FeO needed to eliminate the metalloids must have originated from some other source than the slag or slag additions. This led to a more thorough study of the possibilities of oxidation from the gas.

The common opinion concerning the mechanics of oxygen transfer through the acid open-hearth slag to the metals that the Fe_2O_3 acts as a carrier agent according to the reactions.



at the gas-slag interface

and then



During the boil the convection currents cause the Fe_2O_3 which is formed at the top of the slag to be transferred to the metal surface where it is reduced to FeO . This is a feasible theory but requires an extremely rapid and continuous transfer of a very small quantity of Fe_2O_3 .

If an average of 0.25 Fe_2O_3 were present during the active part of this heat, then only 14.1 lb. of Fe_2O_3 must carry the oxygen from the gas to the metal according to the above reactions. Because 1346 lb. were needed and unaccounted for, essentially 95 round trips for the Fe_2O_3 were required during the refining period. In other words, there would necessarily be a replacement of all the Fe_2O_3 about once every minute and a half on this basis. This is not inconceivable, but does not satisfactorily explain the entire mechanism by which oxygen is transferred from the gas to the metal phase.

At the beginning of this lecture, it was stated that the ultimate goal of any physical chemical study of steel making processes should be the development of control methods which can be used by the melt-shop personnel. A possible control method for the acid open-hearth was the objective of this investigation.

It has been pointed out herein that as the temperature of an acid open-hearth heat increases, the SiO_2 content of the slag increases proportionally, whereas its FeO content decreases.

It was also shown that the MnO content of the slags remained essentially constant throughout American heats. Hence, it would appear that any quick test which would determine the SiO_2 content of the slag would also permit the estimation of the temperature of the slag as well as its FeO content, provided of course, that the usual MnO value of the slag for the given practice is known.

This conclusion is logical because the location of any point on a ternary diagram may be found if the percentages of any two of the three constituents are known. In this case if the SiO_2 content of the slag may be determined quickly by some means and the MnO content is set by charging practice, then the FeO content of the slag as well as its approximate temperature may be determined. This becomes apparent after a reconsideration of the ternary diagrams. Here it was shown that the composition of the slag with respect to SiO_2 and FeO contents was determined by the temperature and its MnO content.

The question now arises as to what quick and simple test may be taken by the melt-shop personnel and used to determine the course of the heat on this basis. The method of determination of slag fluidity similar to that described by Herty for basic open-hearth slag was selected for the purpose of a quick determination of SiO_2 content.

The test mold used in this work had a $\frac{3}{8}$ -in. bore instead of $\frac{1}{4}$ in. suggested by Herty. The former diameter has been found to be more universally useful for the acid open hearth. A sketch of the mold being used by the Acid Open Hearth Research Association is shown herein.

Juppenlatz and Kramerov have shown that the fluidity of acid electric or acid open-hearth slags is a function of their SiO_2 contents. This relation has been confirmed by the work of some of the author's associates and some recent data are shown.

In this figure it may be seen that

the flow or fluidity test is quite sensitive to changes in SiO_2 content of acid slags. One inch of flow is equivalent to plus or minus one per cent of SiO_2 . The slags having a long "run" (ie., above 11 in.) are very early slags. As the heats progress the SiO_2 content increases and the fluidity decreases proportionally. Usually tapping slags run from 4 in. to 9 in. in this mold. Some plants operate towards a 6-in. run at tap and others towards a 9-in. run, depending somewhat on the product.

The points in this figure represent tests made on two heats from different plants—one a casting and the other an ingot shop. Hundreds of such tests have been taken by the author's associates and it is known that this relation is reliable.

The significance of this test is further clarified if the relation of fluidity to SiO_2 content is kept in mind while studying the diagram shown herein.

A heat charged to give 10 per cent MnO in the slag would tend to follow the 10 per cent curve of this figure as the temperature increases. The fluidity test may be taken at any time during the heat and the SiO_2 may be estimated from the fluidity curve. The $\text{FeO} + \text{CaO}$ content may then be determined from this figure since the SiO_2 and MnO contents are now known. The minimum temperature may also be determined.

If for example the fluidity reading were 7 in. for a given slag then the SiO_2 content would be approximately 54 per cent (according to the fluidity curve). With 54 per cent SiO_2 and 10 per cent MnO the ratio of

$$\frac{\text{FeO} + \text{CaO}}{\text{MnO}} = \frac{3.6}{1} \text{ according to figure.}$$

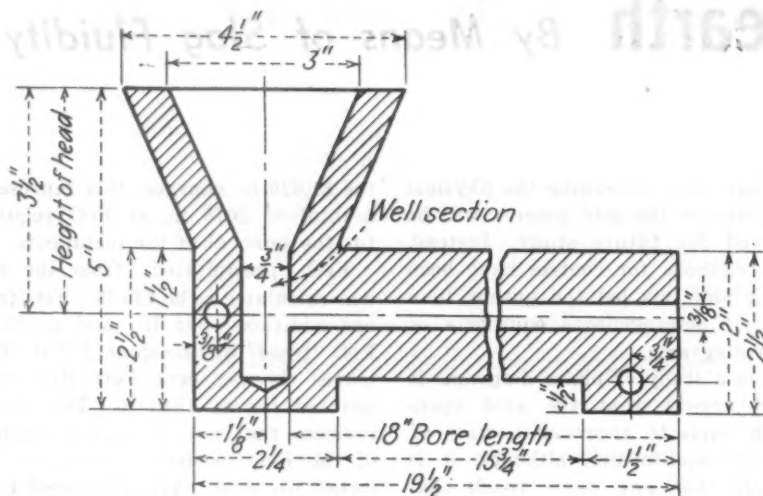
Hence, the $\text{FeO} + \text{CaO} = 36$ per cent. If no lime has been added to the heat, this represents essentially 36 per cent FeO . If on the other hand, limestone is used and the usual slag contains 5 per cent CaO then there is approximately 31 per cent of FeO present. In addition, it may be seen that the minimum temperature of this particular slag sample was about 2940 deg. F., according to the diagram.

A combination of the fluidity curve and the ternary diagram may then be used as a guide by the plant personnel. The fluidity values may be translated into SiO_2 and FeO contents of the slag as well as give an estimate of the temperature, providing the usual MnO content of the slag is known for the practice under consideration.

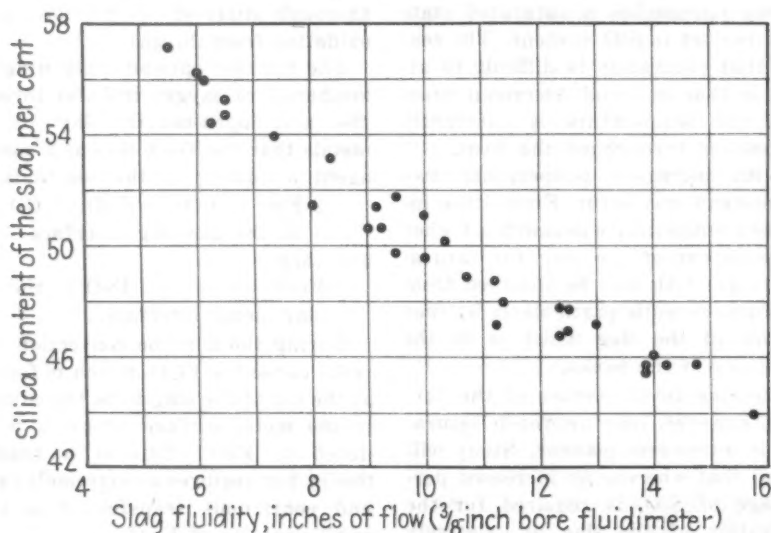
Fluidity readings taken too soon

after a limestone or an iron ore addition should be avoided, because the fluidity will be abnormally high.

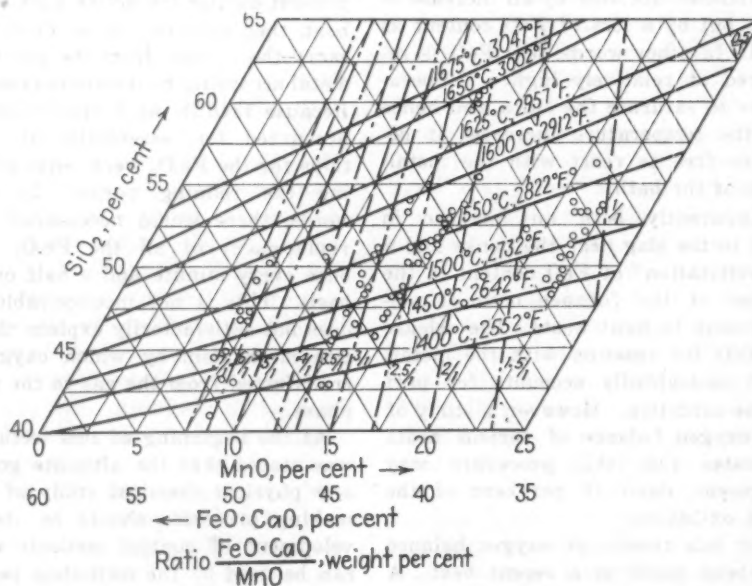
Some 10 to 15 min. should be allowed after such additions in order to obtain a reliable fluidity value.



● Viscosimeter for use with acid open-hearth slags.



● Relation of silica content to slag fluidity in the acid open hearth.



● Section of FeO-MnO-SiO_2 system showing composition of slags from 14 acid open-hearth heats.

Big Strides Made In Welding Techniques



... A few of the highlights of the 60 or more papers presented at the 25th annual meeting of the American Welding Society, held at Cleveland. Research in the weldability of metals continues on several fronts. New methods and new materials have been developed to meet wartime needs.

Welding in Shipbuilding

WELDING of large ships is here to stay and the perfection of the art will be the aim of all interested in the marine field and in welding generally, according to Rear Admiral Howard L. Vickery, vice-chairman of the U. S. Maritime Commission, who spoke at the opening session of the American Welding Society. The entire course of the shipbuilding program was built around the all-welded ship and has proved a distinct success, he said, since it has enabled mass production methods to be applied in shipyards for the first time. The full application of assembly line methods was never applied to riveted ship construction during World War I. At Hog Island, for example, 69 riveted vessels were turned out in one month in 1919 on 50 ways while in 1943 one 12-way yard turned out 205 welded ships in a month. Admiral Vickery also pointed out that in spite of the average higher pay scale in the shipyards today, the cost is now \$160 per deadweight ton as against \$210 for the last war.

Welding permits a subassembly to be made into a finished unit which can then be transported to the ship without impairing its structural integrity. Thus many men can be engaged at one time in making up the large subassemblies on the various assembly platens. The amount of welding and fitting needed on the ways is considerably cut down, which adds up to a reduced time between keel laying and delivery. Whereas it took 180 days between keeled laying to delivery prior to Pearl Harbor, in December, 1943, 118 Liberty ships were delivered under 40 days and one month was the average time keel-laying to launching.

By adequate planning of the work, it is possible to do a large percentage of the welding in the downhand position, and thus utilize less skilled welding operators, particularly on the as-

sembly platens and in the shops. Assemblies and erection procedures are planned so that as much welding as possible on the ways is in the downhand position, Admiral Vickery stated.

Admitting that the causes of the relatively few serious fractures occurring on welded ships is not yet fully known, Admiral Vickery admitted that there is still a lot to learn about stress distribution and behavior of an all-welded ship's hull under service conditions. He noted that the small all-welded ships have been practically free from serious failures, probably due to the relatively light plates used and to less beam action of the hull due to waves.

Since records of failures indicated that most of the relatively few serious fractures started around hatches, Nos. 2, 3, and 4, in the summer of 1943 the Maritime Commission issued orders to round the corners of these hatches on both existing vessels and those under construction. Due to the resultant

better stress flow obtained, Admiral Vickery feels that this step will greatly diminish the chances of cracks starting from hatch corners. On new ships the insert type of deck plating at the hatch corners is being avoided as experience has shown that it is extremely difficult to properly weld such structure. While cracks around hatch corners on riveted ships are quite common they seldom spread to more than the first riveted seam. In welded ships, however, such cracks have in some instances propagated rapidly into a complete failure of the deck and upper portions of the side shell. To prevent such failures, double riveted gunwale angles on the upper deck have been substituted for the continuous welded construction so as to prevent a crack which started in either the deck or the shear strake from progressing into each other. It was also felt that this riveted joint would introduce a degree of flexibility in an otherwise rigidly welded hull. Later a crack arrestor slot on the upper deck of these vessels was called for, running fore and aft approximately from hatches Nos. 2 and 4 inclusive. Admiral Vickery also stated that the danger of so called notches is appreciated whether they are due to poor workmanship or to design details. He concluded that the careful working out of welding procedures and the adherence to them are necessary in order to produce sound hulls.

Welding in Ordnance

STRESSING the fact that the partnership of the U. S. Army Ordnance Department with science and industry has been successful beyond all expectations, Col. S. B. Ritchie, Office of the Chief of Ordnance, paid tribute to the help given by the A.W.S. Army Ordnance Advisory Committee which has helped arsenals and the services to formulate and recommend policies relating to welding practice. A manual on arc welding and inspection has been prepared by the above committee and it will soon be available to ordnance contractors.

At the end of the session, in behalf of Maj. Gen. L. H. Campbell, Jr., Chief of Ordnance, Col. Ritchie pre-

sented to David Arnott, president of the American Welding Society, the Ordnance Distinguished Service Award for outstanding engineering advisory service in the development of ordnance materiel.

Welding has played a major role in the manufacture of ordnance materiel, Col. Ritchie said. He cited as the advantages of welding, complete design and engineering freedom, saving in weight from 15 to 40 per cent, cost reduction from 10 to 30 per cent (both attained with increased service performance), simplicity of application to meet functional requirements, and finally the flexibility in emergency redesign and in the repair of ordnance

equipment that had been damaged either in battle or in service. In this connection the application of the weld surfacing technique has almost an unlimited scope. The savings obtained by building up worn parts are spectacular, the speaker said.

As a result of research work that has been carried on for years the ballistic integrity of welded joints can now be accurately predicted. Col. Ritchie also said that the welding industry was on the threshold of a major discovery in the form of a new type of ferritic electrode for hardenable steel. (See "Welding Electrode

Coatings" in latter part of this report).

Many items of ordnance materiel could never have been successfully produced except by welding. The hull for the amphibious "duck" could not have otherwise been constructed. It has 1300 ft. of arc welding in it and there have been less than a dozen welding failures, according to Col. Ritchie. He cited welded combat tanks as another example, since riveted designs had certain obvious defects. In this connection Col. Ritchie indicated that in June, 1943, 60,000 tons of armor plates alone had been arc welded.

Weldability Tests

FOR a number of years attempts have been made to evaluate the weldability of steel by the arc welding process. A year ago methods devised at Lehigh University and Rensselaer were compared. Both attempted to set up a measure of the rate of cooling in the weld as related to the hardness of the materials in heat affected zone and its ductility. In the Lehigh system, heat input, measured in terms of volts, amperes and welding speed, and the quenching effect of the surrounding steel are related to a given point on a Jominy test bar. The corresponding ductility must be determined separately by experimental tests.

At this 1944 session C. E. Jackson and George G. Luther of the Naval Research Laboratory proposed a bead-weld nick-bend test for weldability. In the proposed test a weld bead is laid down on a test plate of a given thick-

ness. With a hack saw a slot is then cut through the bead material to a depth of 3/64 in. below the surface of the plate. This notch stops short of the heat affected zone in order that when the bar is bent in a modified U-bend testing machine, the initial deformation will occur in the weld metal and failure will be caused by rupture of the low ductility metal in the heat affected zone. The angle at maximum load serves as an index of the behavior of the material. The results for the bead-weld specimens are compared with identical specimens prepared from the original plate material. Tests can be made under conditions closely simulating those encountered in practice with regard to steel composition, thickness of plate, brand of electrode and welding technique actually used, the authors maintained.

Solid Phase Welding

"SOLID Phase Welding" was the subject of the Adams Lecture delivered by Dr. A. B. Kinzel, vice-president, Electro Metallurgical Co., and chief metallurgist, Union Carbide & Carbon Research Laboratories, Inc., units of Union Carbide and Carbon Corp. The Adams Lecture, established at the 1943 annual meeting to honor Dr. Comfort Avery Adams, is devoted to the exposition of scientific data bearing on the engineering aspects of some subject in the welding field.

Dr. Kinzel used the term "solid phase welding," to describe the method of joining two structural members in which none of the material is melted at any time during the welding process. A recently developed practical

application of this welding process is oxy-acetylene pressure welding, which Dr. Kinzel defined as a process by which structural members are bonded by atomic forces without the presence of a liquid phase at any stage of the process, comprising pressing together clean, smooth surfaces so as substantially to exclude air, and maintaining suitable pressures while heating to effect bonding. In pressure welding, an oxy-acetylene heating head shaped to conform to the shape of the members being welded is used to heat the abutting ends to the welding temperature.

Dr. Kinzel's paper was concerned principally with the bonding mechanism or method by which a sound,

strong weld is obtained without the melting and fusion usually associated with the formation of a weld. He cited theoretical and experimental data to support the conclusion that the mechanism of pressure welding comprises atom transfer across the interface (contacting surfaces of abutting members) in accordance with the laws of diffusion with a resultant trans-interface crystallization.

Temperature was shown to be the dominant factor in the practical application of solid phase welding. A temperature of 1050 deg. C. appears to be the feasible minimum, with a maximum of about 1200 deg. C., well below the melting point of the lowest melting constituent of the metal.

Successful experiments with the welding of austenitic steels and various brasses were reported. Numerous tests have led to the conclusion that complete interface elimination as determined by the microscope is the best scientific criterion of the quality of a pressure weld although such physical properties as yield strength, tensile strength, elongation and reduction of area confirm the quality of the weld made.

At another session, A. R. Lytle, Union Carbide & Carbon Research Laboratories described the practical application of oxy-acetylene pressure welding to butt joining of rails, oil line pipe up to 24 in. in diameter, joining of tubing and the forming of pressure vessels. For joining long members such as railroad rails and overland pipe, presses equipped with side clamping jaws are necessary to apply the upset pressure. Hydraulic pressure is preferred to mechanical means. Most pressure welding now being done is carried out at pressures of from 2500 to 4000 lb. per sq. in. of abutting surface and for high alloy steels it is even higher.

Multiple, small oxy-acetylene flames, such as are used in flame hardening, are used to supply the heat and are directed against one side of the work, except in the case of heavy walled tubing. To obtain uniform heating, the blowpipe is kept in oscillatory motion with respect to the work, or the work itself may be revolved where short sections like tubing are involved. This permits higher concentration of heat without danger of burning the surfaces of the steel. Prior to welding, the faces are cleaned with acetone or other grease solvent and are then butted together under a pressure of about 500 lb. per sq. in. After the opposing pieces have been lined up properly, the full pressure is applied

TABLE I
Characteristics of the Three Fundamental Electrode Groups

Description A.W.S.-A.S.T.M. Classification	Group I		Group II		Group III	
	E6010	E6011	E6012	E6013	E6020	E6030
Welding position	All	All	All	All	Flat and Horizontal	Flat
Best operating currents	d.c.(R)	a.c. or d.c. (R or S)	d.c.(S) or a.c.	a.c. or d.c. (S or R)	d.c. or a.c. S-H fillets R-flat	d.c.(R) or a.c.
Fillet profile	Flat	Flat	Convex	Convex	Concave	Concave
X-ray quality* (holes/in. ² of weld)	2-5	1-3	15-20	3-6	0-2	0-2
Penetration (approx.)	2.0	1.3	1.2	0.5	1.8	2.3
Spatter (approx. %)	13	13	7	7	10	10
Efficiency (approx. %)	76	74	79	75	67	66
Physical properties*						
Yield point, psi.	57,000	57,000	63,000	59,000	58,000	58,000
Tensile strength, psi.	68,000	68,000	76,000	70,000	66,000	66,000
% Elongation in 2 in.	25	26	18	20	28	28
Impact-Izod (ft.-lb.)	57	64	36	40	64	64
Distinguishing coating constituent	Cellulose		Titania		Iron oxides	

* X-ray quality and physical property values are typical of what may be expected of these electrodes when recommended welding procedures and standard methods of testing are used.
(S) straight polarity. (R) reverse polarity.

and is maintained during the heating cycle. The bulge which is obtained is characterized by smooth, well-rounded fillets. In rail work, the excess metal is cut off with an oxy-acetylene torch and the surfaces contacting the wheels are ground.

Over 650 miles of pipe varying in size from 2 to 24 in. in diameter have been laid by this process in the last two years, Mr. Lytle said. The average welding time is 1 to 1½ min. per weld. Another application of pressure

welding is to the fabrication of oil well tool joints. The process is also being used on a large scale for joining two stainless alloys in rather heavy sections as well as for welding cylinders in which liquefied gases are shipped. A completely automatic machine has been developed for pressure welding of boiler tubes. Portable pressure welding apparatus has been constructed for shop welding pipe and other structural sections varying from 2 to 6 in. in diameter. Another no-

table application cited by the speaker is the butt welding of high speed steel tool tips to low carbon steel shanks.

Welding Electrode Coatings

The frankest exposition that has ever been given on electrode coating composition was made in a paper presented by D. C. Smith and W. G. Rinehart, Harnischfeger Corp., who discussed in particular the two new all-position a.c. electrodes, classifications AWS E6011 and E6013, as well

TABLE II
Coating, Slag and Weld Metal Compositions of Representative Commercial Electrodes from the Three Fundamental Groups

Constituents	A.W.S.-A.S.T.M. Classification Nos.									
	E6010		E6011		E6012		E6013		E6020	
	Coating, %	Slag, %	Coating, %	Slag, %	Coating, %	Slag, %	Coating, %	Slag, %	Coating, %	Slag, %
SiO ₂	32.9	37.8	22.9	....	19.6	17.6	25.9	....	31.4	43.5
TiO ₂ + ZrO ₂	13.9	17.6	25.3	....	42.2	46.3	30.6	....	....	....
Al ₂ O ₃	1.7	3.6	0.5	....	2.3	5.1	5.9	....	1.8	5.9
Fe ₃ O ₄	....	....	....	....	....	....	....	....	31.8	....
Fe ₂ O ₃	....	....	....	....	....	0.8	....	....	....	1.8
FeO	....	....	....	....	....	6.3	....	....	....	14.5
MnO	....	15.6	....	....	....	14.7	....	....	....	23.8
CaO	0.8	1.2	1.8	....	3.5	0.2	1.6	....	2.3	3.3
MgO	4.6	6.2	8.3	....	4.4	4.7	2.6	....	0.4	....
Na ₂ O	8.6	....	3.8	....	3.1	2.9	1.1	....	2.6	3.7
K ₂ O	....	....	4.4	....	1.5	1.7	6.7	....	1.3	2.2
CO ₂	0.3	....	2.3	....	3.1	....	1.7	....	2.6	....
Organics*	28.9	....	23.9	....	10.2	....	17.7	....	9.6	....
Fe	1.8	....	1.9	....	2.8	....	2.1	....	2.8	....
Mn	6.5	....	5.2	....	7.6	....	4.8	....	14.6	....
Element	Weld Metal Analysis, Per Cent									
C	0.09		0.10		0.08		0.07		0.10	
Mn	0.42		0.46		0.35		0.40		0.37	
Si	0.25		0.18		0.13		0.13		0.16	
P	0.03		0.03		0.03		0.03		0.03	
S	0.03		0.03		0.03		0.03		0.02	

* Includes H₂O.

as a new type of ferritic rod recently developed to replace austenitic electrodes for welding armor plate and other alloy steels of high hardenability. This latter rod has been "under wraps" until this time.

The authors suggested the study of the influence of various coating materials on the arc energy distribution between cathode and anode as a means of evaluating the influence of possible coating materials on their arc behavior. They pointed out that an equal distribution of energy between cathode and anode is desirable for a.c. welding. Some of the complex minerals used today are overbalanced in this regard. They also proposed a study of the melting points, density, viscosity and surface tension of slags, based on work done on open-hearth slags.

Characteristics of the three fundamental groups of welding electrodes are given in Table I, while the compositions of representative commercial electrodes from these three groups are given in Table II. Similar data for the coating of the new ferritic type electrode are given in Tables III and IV.

In designing the latter electrode, the main object was to avoid cracking in the base metal under the bead, largely attributed to the precipitation of dissolved hydrogen in the fusion zone. Hence a coating composition was sought that would not liberate

hydrogen that will precipitate in the weldment. This requirement is met with an all mineral coated electrode with a high carbon dioxide-hydrogen ratio, such as used on austenitic electrodes. Because organic materials liberate hydrogen, coatings without organic materials are necessary. The most successful minerals used to date

are calcium carbonate, calcium fluoride, magnesium aluminum silicates and ferro alloys, with the usual binding agents, sodium and potassium silicates. The authors also indicated that the all-position a.c. electrodes (AWS E6011) had been made possible by the commercial availability of potassium compounds.

Multi-Arc Welding

LARGE amounts of heat are capable of being delivered in concentrated form to the surface of the material being welded while being under perfect control in the multi-arc welding process developed by the research laboratory of the Curtiss-Wright Corp., Buffalo, for aluminum sheet fabrication. As described in a paper by M. R. Rivenburgh and C. W. Steward, the essential elements of the process are: a twin-carbon torch, a heavily coated metallic electrode and holder, the part to be welded and two sources of current. One source is a.c., which is used to supply the twin-carbon torch because it results in even burn-off of the carbons. The other may be either a.c. or d.c. for supplying the metallic electrode. This combination is particularly good as a source of energy for welding because the heat may be efficiently concentrated and

accurately controlled at all times.

In operation, the twin carbon torch is held in the right hand so that the carbons are in a plane, at an angle of 30 deg. to the vertical and moved along the joint, traveling from right to left while keeping the joint to be welded midway between the points, with the carbons about 1/8 in. above the workpiece. A certain degree of arc heat control is obtained by adjustment of the arc gap.

Depressing a thumb lever on the twin-carbon torch handle causes the two carbons to contact each other, thus producing an arc. By releasing the pressure slightly, the proper arc gap is easily adjusted. The twin-carbon torch arc is then moved to within 1/8 in. of the workpiece where welding is to begin. A circular motion of the arc is momentarily employed for about 5 sec., which tends to preheat the

TABLE III
Composition of Coating, Slag, Core Wire and Weld Metal of a Commercial High-Tensile Ferritic Electrode (NRC-2A)

Constituents	Coating, %	Slag, %	Element	Weld Metal, %	Core Wire, %
SiO ₂	10.0	19.87	C	0.14	0.12
TiO ₂ + ZrO ₂	10.0	10.92	Mn	1.75	1.80
MgO	1.0	0.53	Si	0.25	0.06
CaO	36.0	34.82	Mo	0.34	0.03
Na ₂ O	1.9	1.65			
Al ₂ O ₃	0.3	1.29			
FeO	....	2.09			
Fe ₂ O ₃	0.75	0.26			
CaF ₂	....	20.75			
MnO	....	6.77			
CO ₂	15.0	....		
F ₂	11.0	....		
Fe	5.0	....		
Mn	3.9	....		
Si	3.3	....		
Mo	1.75	....		

TABLE IV
Physical Properties of a Commercial High-Tensile Ferritic Electrode (NRC-2A)

	As-Welded	Stress Relieved
Transverse tensile, psi.*	106,800	112,500†
% Elongation in 2 in.	15.0	20.5
% Reduction in area	38.0	52.0
All-weld metal‡		
Ultimate tensile strength, psi.	105,700	94,200
Yield point, psi.	86,700	81,700
% Elongation in 2 in.	20.5	24.5
% Reduction in area	26.6	66.8
Impact strength (Charpy)		
Temperature, deg. F.	70 30 0 -30 -50	
Load, ft.-lb.	40 38 37 34 33	
Rockwell C hardness values		
Weld metal	24-28	
Fusion zone	26-30	
Base metal	28-29	

* Standard Navy "torture" test plate procedure using 1 1/2-in. armor plate was followed in making these transverse tensile test bars.

† Water quenched from 1650 deg. F. and drawn at 1150 deg. F.
‡ A.W.S.-A.S.T.M. Specification A233-43T procedure followed in making these all-weld metal tensile test bars.

work at the starting point. At this time, auxiliary arcing takes place between one of the carbons and the workpiece.

The next operation is the introduction of the metallic electrode, which is held in the left hand and placed directly over the seam to be welded, contacting the surface of the workpiece at the starting point.

The twin carbons and the metallic rod are kept approximately 3/16 in. apart. Arcing now takes place between the metallic electrode and the carbons, from one carbon to the other, from the metallic electrode to the workpiece and from one carbon to the workpiece. All of this produces five individual arcs functioning as one. The arc action causes immediate fusion of the metallic rod deposit and the parent metal, producing a weld with uniform penetration and free from porosity.

The current supply for any individual circuit is not sufficient to pro-

duce welding by itself. A constant, smooth arc is maintained from the metallic electrode to the carbons and the ground because of the ionization produced by the carbon arc flame. As a result, control of the heat is such that it has been possible to weld 0.016 in. Alclad 24S-T aluminum alloy by this process without a back-up strip. Reverse polarity is preferred while welding aluminum, although straight polarity may be used.

The heat transfer and temperature are of a nature which permits the parent metal to receive preheat and the weld deposit to acquire post heat. This allows all gases and impurities to escape to the surface of the molten metal before it becomes plastic enough to entrap them and cause porosity. The appearance of the weld surface is sometimes affected by this action causing roughness. However, metallographic and X-ray studies indicate that this is a surface condition only.

ing of aluminum are a primary deterrent in spreading the application of the process, in the manufacture of peacetime products there will be much greater freedom of action. He predicted much wider use of the method after the war.

Results of a series of experiments in welding of 1/4 in. mild steel (0.14 C) plate which had been carefully pre-cleaned with Oakite No. 32 compound at half strength were reported by R. F. Hensel, E. I. Larsen and E. F. Holt of the research department of P. R. Mallory & Co. The work was done in a conventional single-phase press type welder using 1 1/2 in. dia. refrigerated (-13 deg. F) tips of Mallory 3 metal, made of four different shapes: (A) 2 in. rad. sphere, (B) 1/2 in. spot with 30 deg. approach angle, (C) 2 in. rad. with 1/2 in. dia. flat, and (D) a flat surface on the lower electrode and point (C) on the upper. Welds were made with various secondary currents and seven different time cycles to determine optimum conditions. A pressure of 3000 lb. was used throughout the tests.

Among the authors' conclusions were the following: Porosity as revealed by X-rays were present in all welds when the time cycle was 4 cycles or lower. Electrode (C) gave the highest shear values with the least indentation of the metal, although the highest value of shear was obtained with electrode (D) with a 5 sec. time cycle. In general, optimum results could be obtained with electrode (C), with either a straight 5 sec. time cycle or with a pulsating current involving 20 cycles "on" and 10 "off" for 15 pulsations, the former using about 20,000 amp. and the latter 25,000 on the average.

In the discussion, much was made of the fact that many plants actually spot weld thick material without attempting to clean it, although cleaning assures much sounder welds. Pickling, sandblasting and shot blasting are being employed by firms fabricating material up to 1/2 in. in thickness. Considerable argument centered around whether the three-phase system described by Mr. Sciaky was less disturbing to power lines than single phase loads which had power factor correction through condensers. Mr. Sciaky maintained that for welding 3/4 in. steel plates with three-phase power, 600 kva. would be required, whereas a single phase transformer would call for 1200 kva. In the former case, there is only 1/6 the amperage drawn from each line.

Welding Heavy Gage Materials

SPOT welding of heavy gage materials, including structural steel, is practical provided there are not too frequent design changes being made and there is sufficient volume to warrant mass production setups, according to Mario Sciaky, Sciaky Brothers, Chicago. He illustrated roof trusses and crane booms that had been spot welded with semi-portable units, suspended from cranes or gantries that could be brought to the work.

Welding of heavy gage materials, either ferrous or non-ferrous, is not practical with stored energy type machines, Mr. Sciaky said. The required time cycle for the heavier materials is too long, and if a single shot is used enormous currents must be supplied to obtain the required energy, although he did cite the successful spot welding of 3/16 in. aluminum with 140,000 amp. In welding heavy gage steel, where the time runs up to 5 or 6 sec. instead of a few cycles of a 60 cycle wave, a machine has been developed that operates on the principle of pulsating direct current, and which overcomes the disadvantages of conventional single phase a.c. machines.

This unit draws power from a three-phase line, rectifies it through ignitron tubes and feeds it to the primary of a modified a.c. transformer, not to be confused with the reactor units em-

ployed on standard Sciaky aluminum welders. A pair of electronically timed ignitron tubes alternately feeds a shot of d.c. to split coils of the transformer primary, giving 6 to 20 cycles per sec. of reversed d.c. for a matter of several seconds. Advantages claimed for the system are a balanced power load on the feeder lines, high power factor of the transformer because of the low frequency and by the same token more efficient use of transformer material because the current and flux goes through the entire transformer instead of flowing around the outside due to skin effect, which occurs even with 60-cycle current. For 3/16 in. material, flat electrodes, 1 1/4 in. diameter, are used and these must be adequately water cooled to prevent mushrooming.

Presence of scale on most structural material is overcome by using a high contact pressure at the start of the cycle in conjunction with a low preheat current which tends to reduce the oxide. During the actual welding period the pressure is reduced and the current increased, followed by an increase in pressure to forge the weld nugget. Post heating and controlled quenching then follows in the case of hardenable steels like armor plate.

Mr. Sciaky concluded that while Army-Navy restrictions on spot weld-

What To Do Before

Contract Terminations

ANTICIPATING the major job of contract terminations confronting all war contractors, forward looking companies have set up a contract termination department under the supervision of a responsible executive. Such additional personnel as appears to be necessary from time to time will be added to this department.

A great deal of material has been published on the subject of contract termination and there will be recorded herewith a general outline of suggestions to be followed by such a department. It should be noted that these suggestions apply practically entirely to what should be done in advance of termination. Although many of the suggestions offered are more applicable to companies that are manufacturing their regular peacetime products for the war effort, the suggestions apply in general to contractors on strictly war work as well.

The suggestions in this article moreover apply more fully to wholesale contract terminations which will come along at the end of one of the major phases of the war. In the meantime there will undoubtedly be many isolated cases of contract terminations where the services have changed their plans or where the vicissitudes of war make certain equipment no longer necessary. In such cases these suggestions can be used wherever applicable. It is advisable to prosecute these isolated termination claims as promptly as possible in order to secure as much experience as possible before the big show starts.

Experiences of 1918

Contract Settlement Act: A considerable volume of historical material covering experiences in contract termination after the previous war has been analyzed. Many of the problems evidenced at that time have been corrected by recent legislation, principally by the Contract Settlement Act of 1944 passed by Congress on June 22, 1944. By the terms of this Act a

... The problem of wholesale contract terminations must be faced now, not when the avalanche comes. To assist contractors in planning for the tremendous job of contract terminations, the author outlines herein procedures for prime contractors in setting up a department with the sole function of handling terminations and in dealing with contracting officers and subcontractors. The legitimate items of expense in making out termination claims are also discussed.

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contracting officer can now make a reasonable settlement on a claim without being personally liable for such settlement.

Verbal and Unexecuted Contracts: At the end of the first World War there were many government orders in process in connection with which no official contract had been signed and approved. Many of these orders were not evidenced by a notice of award or authorization to go ahead—in fact some of them were verbal. The Comptroller of the Treasury announced a decision, dated Nov. 25, 1918, which stated that such orders were entirely void and it was not then possible for the government to correct the entire situation by issuing formal contracts, since the govern-

ment no longer needed the material.

It was not until Congress passed some additional legislation several months later that settlements were started on such contracts. As a matter of fact the termination clauses in the bona fide firm orders and contracts were not used; settlement was made according to Supply Circular No. 111 containing more liberal terms. It is stated that in practically every instance settlements were handled fairly.

Length of Time for Settlements: Six or eight months after the end of the first World War no settlements had been made of any of the claims. However, a year after the war ended 90 per cent in number and 50 per cent in value of the claims were settled. Nevertheless, two years after the war there were still 10 per cent of the claims unsettled.

There are at present 10 times the number of contracts outstanding as compared to 1918 and 10 times the value. This clearly emphasizes the necessity of closing any claims now pending to prevent their getting mixed with the great volume that will be on hand at the end of the war. Also, it is strongly urged that collections be kept up-to-date and not allowed to lapse in view of the long hold-up

Previous articles by Eugene Caldwell that have appeared in THE IRON AGE are as follows:

"How to Operate Seven Days per Week," Dec. 25, 1941, p. 47.

"How to Rate Employees," Aug. 15, 1940, p. 43.

"Physical Examinations for Employees," Aug. 29, 1940, p. 38.

"Cost Accounting," June 27, 1940, p. 32.

"Gantt Charts for Production Control," April 18, 1940, p. 46; April 25, 1940, p. 46.

"Job Rating," Sept. 7, 1939, p. 48; Sept. 21, 1939, p. 39.

in payments after the armistice of 1918.

Detailed Audits: In 1918 claims for each item on hand were submitted to government auditors in great detail and there were thousands of auditors in the field. Overhead was carefully gone into, and when there were disputes, expert accountants visited the contractor and examined the books, records, and accounting methods used, and a written audit report was prepared. Subcontractors were checked, too, and contractors were required to show receipts for payments to subcontractors.

The detail required can be seen by an example of a contract for rheostats. There were 40 component parts in the assembly. A cost study was required using a large tabulating sheet for each part. In this particular case, for example, one spring had 14 different operations, and 14 detailed cost records were shown, one for each operation, with the inventory of springs on hand at the end of each operation. Another assembly of 100 different parts required 100 different tabulation pages—15 x 24 in.—for parts in process.

It is believed that settlements at the end of the present war will be a little more streamlined, it now being possible for contracting officers to make negotiated settlements. However, all claims will no doubt have to be substantiated by considerable detail.

The settlements made after the previous war averaged 12½ per cent of the completed contract price.

Resisting Terminations

There is not very much a company can do to prevent terminations when they come along, although every concern should be in a position to present such data as may assist in retaining an order. If a company is the only source of supply for certain equipment, the following remarks will not apply. However, with other businesses manufacturing a competitive product the government may have the choice of cancelling production of any of the competitors. In general the government will cancel the highest cost manufacturer where another supplier furnishes the same equipment at a lower cost. However, since manpower is, and perhaps will be, the most important bottleneck, economy in manhours will certainly be given consideration. Consequently it would be desirable to have available data on man-hours required to produce each piece of equipment manufactured so it can be submitted to the government for compari-

son with competitors who may be less economical with respect to man-hours.

However, a company should welcome the termination of any equipment on which, because of many impinging factors, money is being lost since under the new standard termination clause a contractor will be allowed to make a profit of 6 per cent on the cost of unfinished equipment provided the total claim does not run over the total contract price.

All later government contracts contain the new uniform termination clause. Some of the older contracts contain previous termination clauses, and in a few cases government contracts or purchase orders have been issued which contain no termination clause whatever. In the latter case the contractor has the authority to go through with and complete the contract, collecting the total amount in view of the fact that the Supreme Court has long established the principle that the government cannot impair the obligation of a contract to which the government itself is a party.

Unfilled civilian orders should be analyzed to determine whether or not they contain any cancellation provisions. It is also possible that permission for the cancellation of some of these orders will be permitted for policy reasons. However, the entire file of orders should be reviewed from the viewpoint of which are likely to re-

main firm after the end of the war and which will be permitted to be cancelled.

Records

Records should be set up so as to coordinate as nearly as possible with termination procedures. Where purchase for materials are placed according to and identified with production orders there already exists provisions for allocating materials pretty much to specific government orders, since each unit on a production order is usually allocated to a specific customer.

It is suggested that perhaps this should be carried a step farther with the separation of production orders into civilian as against government. In other words, it is suggested that separate production orders be issued for civilian requirements to the extent where, for example, a present production order for 25 units which now might be 17 units for the Army and Navy and eight for civilian use would be divided into two separate production orders, one for 17 and the other for eight units using different production order numbers.

It should be noted that after securing claims from subcontractors, these will have to be divided up and allocated; that is, a certain percentage to the Navy, for example, another percentage to the Army and another to civilian. It would help just that much

EVERY effort should be made to complete units now in process, as completed units appear in the termination claim at contract price, whereas work-in-process is figured at 6 per cent profit based on cost.



if separate production order numbers were issued for those civilian orders for which no claims can be made.

Some materials are ordered in bulk and cannot be allocated to a particular production order. This is necessary to get reasonable ordering quantities, the reasonableness of such procedure being accepted by the War Production Board.

This class of material is the group where there is most likelihood of excesses. The termination department should carefully check inventories of this material to determine whether there are any excesses over that needed to fill government contracts. Materials of this nature can, of course, be disposed of to much better advantage at the present time than after the war is over. Great care must be taken to include in claims all of the bulk material of this type. If this is omitted from isolated claims for terminations before the end of the war because of plans to use it on other unfilled orders on hand, clearance should be obtained from the contracting officer involved to the effect that it can be included in future termination claims whether or not an excess stock exists.

In the final allocation of parts to specific contracts, it is advantageous to allocate finished parts to parts orders rather than to orders for finished units since it has been ruled that completed items will be paid for at the contract price of whether accepted by the government or not. Consequently finished parts, when applied to parts orders, would bring full profit (which is generally higher on parts than on finished units) as contracted to the allocation of the parts to a finished unit order that would only secure a 6 per cent profit based on cost. This means that parts in process, when making the final claim, should be applied first to all the parts orders on hand, any excess parts left over being applied to orders for finished units.

It appears that it would be an advantage in making termination claims if a company could be included in the group of "smaller war plants" in view of the seemingly greater sympathy in Congress for small plants. The Smaller War Plant Corp. has applied considerable pressure to securing favorable conditions for its group. The line of demarcation between a small plant and a large plant appears rather vague. The Smaller War Plant Corp. establishes 100 employees as the limit, but the Army uses the figure of 500 employees.

It is possible that consolidated claims can be presented for all of the orders for a particular service or contracting officer. This would no doubt be an advantage since it would greatly simplify record keeping and preparation of claims. On the other hand, it might be a disadvantage because larger claims require more careful consideration. Claims under \$500 are submitted on a short form and apparently will be settled without a detailed audit. Claims for more than \$5,000 must go to the contracting officer's Settlement Advisory Committee before being paid. Claims of \$50,000 or more must be reviewed by the Departmental Reviewing Committee, and claims of \$5,000,000 in amount must go to the Director of Purchases Division, Headquarters Army Service Forces.

Attention should be called to the importance of complying with all the provisions in government contracts, particularly the one requiring notification of the contracting officer when there is a delay. If there are any cases where such notification has not been given, it is possible that the government may attempt to terminate the contract for default rather than for the convenience of the government. It should be the contract termination department's responsibility to make sure that written notification of each delay goes to the contracting officer on each contract.

Inventories

A general study should be made of the inventory to determine what part, if any, can be disposed of after the war without loss. At the time of making settlement it is required that the contractor make an offer of any of the inventory he wants to retain. Consequently an analysis should be made at the present time to determine what the company can afford to pay for any of the inventory so that the offer will be ready. This item should not be the cause of delay in submitting the claim. An analysis should be made of the firm postwar orders on hand, the likelihood of a change in design of the model involved, and how long the supply of materials would last under postwar conditions. If the materials could be purchased cheaply enough, it might pay to stock considerable quantities for the future, although, of course, how far into the future a contractor can project depends entirely upon how low the purchase price would go. The importance of securing as many firm postwar orders as possible is clearly indicated.

In determining what a concern can afford to pay for certain inventories, a general price analysis should be made. The price of some commodities perhaps has not increased for several years. These commodities can perhaps be taken at a figure more nearly the cost price as contrasted to other materials in connection with which very high prices exist at the present time.

Inventory Clearance

In connection with investigation of any excesses in inventory, already mentioned, War Production Board approval should be obtained for carrying the excess. War contractors are warned against getting "inventory jitters," and to eliminate this, the Contract Termination Board has announced that it will not attempt to police the War Production Board's regulations in connection with a 60-day inventory, but will make settlements on the basis of a greater inventory on hand providing the inventory is reasonable in amount. Consequently data should be prepared indicating what attempts have been made to keep inventory down and why it has been necessary to keep as much in stock as is now carried. A clearance from WPB would be more desirable than efforts to prove a reasonable inventory and such a request to WPB should not be submitted without being accompanied by the complete picture.

After notifications are sent to vendors upon termination of a contract, the contractor should, wherever possible, refuse to accept further shipments. The shipments should be returned to the vendor and the amount included in his own claim rather than in the claim of the contractor. In no case should a shipment be accepted which has left the vendor's plant after receipt of a wire terminating the contract.

Attention is called to the fact that every effort should be made to complete units now in process as soon as the necessary material arrives in the plant because completed units appear in the claim at contract price, whereas work-in-process is figured at 6 per cent profit based upon cost. Consequently, upon the arrival of a shipment which is delaying the final completion of a finished unit, all available labor should be put on the job of making complete units out of the equipment at hand rather than assembling more units to a partially completed stage.

A study of the inventory should be made from the standpoint of deter-

mining the possibility of using the material later in civilian production. For example, emergency steels are probably on hand which, no doubt, will not be used after the regular steels again become available. Also other substitutions may have been made because the regular materials were not available. Even if the contractor can find some civilian use for this material, he cannot afford to pay much for it.

It must also be kept in mind what units will soon become outmoded. For example, equipment will be a burden if the engineering department is working on an improved design.

In buying the materials from inventory or in disposing of others of inventory, a contractor may be confronted with OPA ceiling prices. For example, higher than mill prices cannot be paid for steel surpluses even though the steel was actually originally purchased at a higher price from a warehouse.

Conditions on Purchase Orders

Great care should be taken to ascertain that purchase orders are protected with terms and conditions that will enable the contractor to comply with the provisions for cancellations and other features to which he has agreed in the prime contracts with the government.

It should be noted that new uniform termination provisions for sub-contractors have just been approved by the government. In the event that difficulty arises with any supplier over the acceptance of these terms and conditions, the full support of the Army or Navy, as the case may be, can be obtained in forcing acceptance by the vendor.

Costs

The extreme necessity of keeping cost department records up-to-date is indicated. When terminations come along, it is necessary to know the latest cost of making each price of equipment.

It is also necessary that up-to-date financial reports be secured in order to establish the latest figures on overhead and additional costs. In addition, government auditors will require these latest financial reports when auditing termination claims.

Latest fiscal year audit reports should be made available because these reports will be the principal source of information in establishing overhead and administrative costs, since later monthly reports do not reflect the full force of certain items such



INVENTORIES should be studied to determine what part, if any, a contractor may wish to retain. If materials could be purchased cheaply enough, it might pay to stock considerable quantities for the future.

as bonuses which may be paid at the end of the year.

It is also suggested that the minutes of conferences with the Price Adjustment Board be made available. In several termination settlements the allowance of profits in renegotiated settlements equal to those allowed under renegotiation have been claimed rather than the formula of 6 per cent limit established where no agreement can be reached.

It is also advantageous to have available the actual cost findings of the government auditors in making forward pricing determinations.

The contractor should be prepared to determine the exact cost of work-in-process, for example, where only six of 20 operations have been performed. If work-in-process inventories, such as are taken at the end of the year, do not go into this detail, the last year-end statement should be analyzed; for upon termination, the cost, for example, of three units that have gone through the first operation, six more that have gone through the first two, 15 more through the first three, etc., will have to be known.

The cost of each piece of equipment taken from the cost analysis should be the determining factor in deciding whether the raw material, the pur-

chased or finished parts, the completed unit, or all of these should be bought from the government. Consideration should be given to the fact that it may not be economical to place on a shelf for postwar civilian use material and parts purchased at high prices, some of them at warehouse prices, and all of which have been made at high overtime rates. An analysis should be made as to what the equipment would cost if adjusted to a straight shift basis such as will probably exist after the war.

There is a definite tie-up between renegotiation and termination which must be realized. The form on which the termination claim is submitted asks the question, "Have any costs been duplicated between renegotiation and termination claims?" This duplication of allowable costs occurs whenever a claim is settled on a contract in connection with which there was some work-in-process at the end of the fiscal year which has been previously renegotiated.

In setting up inventory at the end of the fiscal year, work-in-process is established at cost. Of course, the labor and material in this work-in-process adds nothing to the duplication of costs because these are carried in the inventory at actual cost.

However, the overhead added into the work-in-process at the end of the renegotiated year must be deducted in the termination claim.

It is a little difficult to see at first how this allowance of undistributed costs in the previous renegotiation period duplicates allowable costs in the termination settlement. In fact, the government auditors were not alert as to what was happening at first, but they will catch the matter now.

In order to eliminate this duplication from the termination claim, it is necessary to have an itemized inventory of work-in-process at the end of each fiscal year, the contract to which each one belongs, and the amount of overhead which has been added into inventory. As has already been suggested, if this information has not been collected at the present time, it had better be secured.

Expenses After Termination

It is suggested that list of all the extra expenses to which a business has been subjected on account of the war be tabulated. Some suggested wartime expenses are as follows:

- Expediting offices
- Washington office
- Priorities and production control
- Manpower control
- Rentals of additional space for plant and office
- Enlargement of plant and office
- New equipment for office and shop
- Clerical work in connection with war bond sales
- Bonuses to former employees now in the service
- Additional telephone trunk lines
- Clerical help in connection with certificates of necessity
- Clerical work in connection with War Labor Board and Treasury Department wage stabilization applications
- Expediting at main office

There are perhaps many more additional expenses to which a concern has been subjected. As long as the war continues and there are war contracts in the plant, all of these expenses are included in the overhead applied to war contracts. However, any of them that are necessary to continue after the war and after termination of contracts will not be taken care of by overhead allocation, since there will be no direct labor on government contracts to which to apply overhead. Consequently, these expenses that must continue after ter-

mination should be added into the termination claim itself.

Legitimate Costs

It probably will be decided necessary to continue any existing Washington offices and other expediting offices for some time after termination to follow up claims from vendors, inventories at vendors' plants, and carrying on settlements with them. The personnel now performing many of the activities which can be curtailed after the war will no doubt be required to prepare information to present claims. The clerical force necessary to prepare termination claims, take inventory, and other work related to termination is a legitimate charge in the termination claim itself.

In addition there will be many other expenses to which a contractor probably will be subjected after the termination of war contracts. For example, there may be the expense of moving out of a rented warehouse or converting electrical installations to a permanent basis so they will comply with the city code. Coal stokers may be changed back to oil. All of these expenses are legitimate and should be added to the termination claim.

If it can be proved that any of the equipment purchased is not usable after the war, the undepreciated portion can be put into the termination claim, even though the equipment is covered by a certificate of necessity. Another possibility in connection with this item is to file amended tax returns for the years since the equipment was purchased, depreciating it uniformly over the period of the contracts.

Interest on funds tied up during the period of terminations is a legitimate expense for the termination claim. If a new VT-Loan is in effect, however, there probably will be no interest expense of this nature.

The cost of removal, storage, and sale of government inventories is a legitimate expense for the termination claim as well as any accounting or legal expense involved.

If the state in which a plant is located is on a merit rating basis as far as unemployment insurance is concerned, the additional premium for unemployment insurance is a legitimate charge in the event unemployment results during the change-over from war to postwar work. In addition, the cost of keeping key employees during idleness while getting started again on postwar work is also a legitimate charge, although this charge is not as well established as

an acceptable charge by the government as the others mentioned. Nevertheless, it should be included in the claim.

In preparing claims, one of the most important things to remember is that overhead rates will jump way up as government work falls off in view of the continued existence of some overhead expenses regardless of the flow of work being done. Starting load costs should also be included. In other words, the cost of setting-up is just as great when the contract is terminated at the completion of three units as it would have been if the entire quantity had been finished.

Post Termination Action

One conception of the production schedule after the end of the war might be as follows:

(1) The day peace is declared with Germany, the plant will be closed for a holiday. If this news occurs at night the plant and office would probably be closed the following day.

(2) On the day that cancellations or hold notices are received equal to 50 per cent or more of production, the plant should be closed for a week and physical inventory taken.

(3) The plant should re-open to work on postwar orders (it is certainly necessary that a backlog file of these should now be obtained), the plant being operated in accordance with some predetermined schedule of eliminating manhours such as the following:

- (a) Elimination of Sunday work
- (b) Elimination of women employees
- (c) Elimination of Saturday work
- (d) Elimination of the third shift
- (e) Four days a week operation
- (f) Three days a week operation
- (g) Laying off additional men
- (h) Elimination of the second shift

As contracts are terminated, of course, subcontractors should be cut off, and these subcontractors should be eliminated in the order of their costs. If there is any subcontractor producing materials at a lower cost than the home plant the work in the higher cost shop should be eliminated first.

As soon as terminations make it desirable, any leases on warehouses or emergency property should be cancelled and also on any machine tool equipment rented from the government which is no longer needed.

The thing that is likely to cause the most delay in submitting claims on terminations is getting complete

claims in from various vendors and subcontractors. It may be necessary to check vendors' inventories at their places of business. Without exception it will be necessary for the prime contractor to satisfy himself that the vendor or subcontractor is not adding into his claim more raw material than is sufficient to complete the contract. It should be noted here that the prime contractor will be required to certify as to the claims up to the first level of subcontractors but will be required to go no further in his certification.

In the event that the vendors or subcontractors do not intend to enter a claim, a legal release should be secured from them on the form suggested by the government for this purpose.

The prime contractor should also find out if the vendor or subcontractor desires to purchase any of the materials he has on hand and secure his best offer. In addition it should be determined whether the vendor would be willing to buy back or accept for return any articles of his manufacture in the prime plant. It would be desirable for the termination department to check over contracts with subcontractors and vendors. If any of these are verbal or are indefinite in any way the matter should be cleared up at once.

Termination claims to the government can be submitted excluding the

subcontractor's claims. However, it would be best to present claims including all subcontractors and vendors, and to facilitate this it would be well to contact all subcontractors and vendors now to determine what plans they are making for terminations and what system they plan to follow. It may also be possible to get an idea of what their termination claims are likely to be. That is to say, how long before actual shipment do they actually start work on orders. For example, in order to get delivery on some orders it is necessary to place orders six to eight months in advance of shipments. If terminations come along, say two months after such orders are placed, it is hardly likely that there would be any claim.

Data From Contracting Officers

It would be well to write the various contracting offices asking for information in connection with terminations, which information can be settled at this time. The questions to have answered are as follows:

(1) What disposition is to be made of work-in-process, that is, is the contractor to finish any of the work-in-process into completed parts, or should he stop where the work is on the day terminated?

(2) What disposition is to be made of government materials?

(3) Is the contractor to deal with the same contracting officer or agency for all of his plants?

(4) Is the contracting officer to be represented by someone at the plant and, if so, the scope of his authority should be obtained in writing. For example, if this representative advises a contractor to sell certain materials, the contractor should know if he is to follow his instructions. Is a representative to be present when inventory is taken?

(5) Is a separate claim to be presented for each contract or purchase order or will grouping into a consolidated settlement for all contracts for a particular contracting officer be permitted?

(6) Is there any amount under which a plant can pay a subcontractor's claim without the necessity of further approval?

(7) If possible, it would be highly desirable to know the basis on which a company could purchase for its own use some of the materials which will be left from war contracts. If some indication could be given as to the price at which small quantities of these materials could be purchased for peacetime production, it would eliminate the necessity of going out and purchasing more materials when duplicate materials belonging to the government are lying in the warehouse.

Support Arm for Portable Power Shear

• • • In order to simplify the cutting out of complicated designs from sheet metal stock of a maximum thickness of 7/64 in. with a portable power hand shear, E. A. Forss, a tinsmith at the Fitchburg plant of the General Electric Co. designed and built the swinging arm holding fixture illustrated. This makes it much easier for the workman to operate the shear and gives him better control of the work when cutting complicated designs.

• • •



Measuring and Designating Surface

MANY methods of measuring surface quality have been developed in the past several years, but the Profilometer and the Brush analyzer have played major roles in the progress attained in this comparatively new field of surface roughness measurement. These instruments are tracer point measuring devices which translate actual surface irregularities into values serving as roughness indices.

The Profilometer, a product of the

By **JAMES A. BROADSTON**
*Armament Engineering,
North American Aviation, Inc.,
Inglewood, Calif.*

Physicists Research Co. of Ann Arbor, Mich., was developed about 10 years ago by Dr. Ernest J. Abbott to measure finely finished surfaces used in ball and roller bearings.

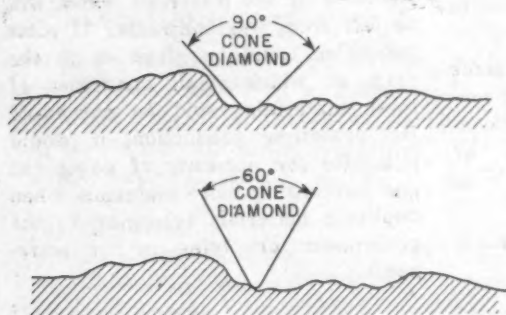
The Profilometer gives a direct indication of the size of surface irregularities. As the tracer unit, contain-

ing a diamond point mounted in an electric pickup, is slowly moved back and forth over a surface, the electric impulses created within the unit as a result of the vertical displacements of the tracer point are amplified to operate a meter needle over a dial calibrated in microinches. The meter needle oscillates rapidly during the reading but lag, inertia and damping inherent within the meter averages out the variable impulses. The roughness value is usually taken as being the maximum sustained reading. Occasional sharp jumps are not considered.

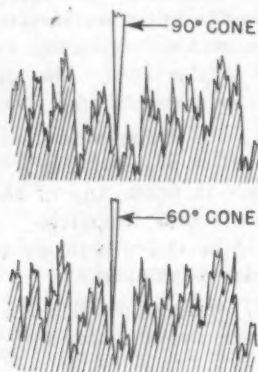
The Profilometer provides an excellent method for making spot-check roughness comparisons of finely finished critical surfaces. Used in conjunction with its accessories, and due to the ease with which it can be operated, it is particularly valuable for rapid production checks.

The Brush Surface Analyzer, manufactured by the Brush Development Co. of Cleveland, consists of an adjustable analyzer head, an electrical amplifier, and a direct-inking oscillograph for recording surface roughness upon a moving paper tape. A diamond tipped tracing stylus at the end of the pickup arm is connected by a lever to a piezo-electric crystal which has the property of generating a voltage when deformed. As the synchronous motor driving unit in the analyzer head slowly moves the pickup arm back and forth over the surface being measured, the tracer point moving up and down along the minute irregularities in the surface, deforms the crystal, which in turn sends electric impulses into the amplifier. The amplifier delivers the impulses to the crystal penmotor of the direct inking oscillograph, which traces a wavy line on the moving paper tape. The line depicts the greatly amplified control of the surface of the part being measured. The design of the Brush Analyzer is such that a certain leakage of electrical energy keeps the recording pen centered on the tape.

The calibration standard provided with each Brush Analyzer consists of a round piece of plate glass upon which two microscopically fine, measured scratches have been cut. The



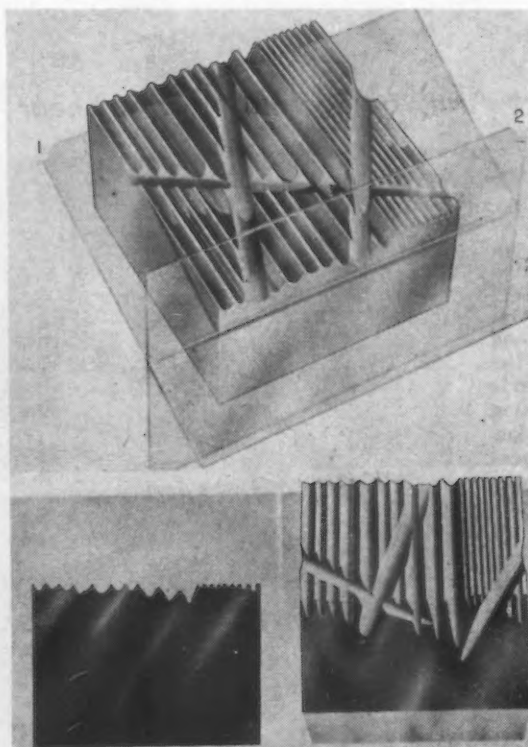
ACTUAL SURFACE CONTOUR



SAME CONTOUR HYPER-MAGNIFIED VERTICALLY 25 TO 1

ABOVE
FIG. 8—Showing how wide angle diamond tracer points will suffice.

RIGHT
FIG. 9—A theoretical photomicrograph of a taper section formed by a plane (1) making a very small angle with nominal surface. Note the apparent magnification of irregularity depths in taper section, lower right. The normal section, lower left, is made by plane (2).



Finish

... In this second of a three-part article, measurements of surface roughness by the Profilometer and the Brush Analyzer are discussed. Novel use is made of the Amsler integrator to determine precise RMS values from profile curves produced by either the taper section photomicrograph or the Brush Analyzer record tape.

glass is mounted in a holder. When the diamond point of the analyzer is run across either of these scratches, the needle of the oscillograph will kick over a predetermined distance if the instrument is in proper adjustment.

Results Compared

The Brush Analyzer tape provides a permanent record of the surface roughness, as interpreted by the analyzer. The curve is an exaggeration of the actual profile because of the super-magnification in the vertical direction. The irregularities indicated by the Brush record, even after correction for vertical magnification, are not the true shape; the record curve is an interpretation made from the motion of the tracer point including any distortions that may result from the mechanical and electrical characteristics of the pickup, amplifier and oscillograph.

The Brush record tape does, however, give more information regarding the actual type of surface configuration than any single roughness number that might be indicated on a meter. Most machined surfaces are uniformly rough or uniformly smooth, the degree of roughness being characteristic of the last operation performed. If, however, additional finishing is done without removing all traces of the previous operation, a duplex surface will result. Such a surface cannot be fully evaluated by a mere roughness reading alone. For example, a roughly ground surface from which the high spots have been removed by fine sandpapering will still give a relatively high roughness reading on a meter even though the surface will perform better than the meter reading indicates. In evaluating a duplex surface, the Brush Surface Analyzer would be found more suitable, as it will give a better idea of the actual shape or form of the surface irregularities.

In general, the Brush Analyzer provides a quick and direct comparison between surfaces—a comparison which is not influenced as greatly by human error as the Profilometer reading might be, and which can be kept as a permanent record. However, the record tape does not give an RMS value.

A precise method of determining that value from the record tape is explained in the discussion on "taper sectioning" which follows.

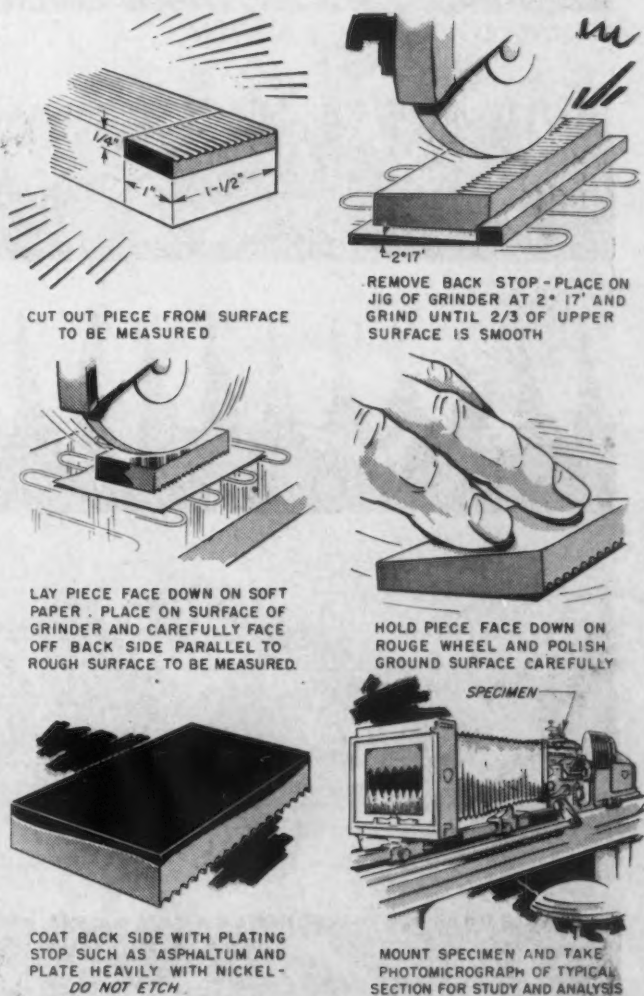
Tracer Point Limitations

There are several factors which prevent present-day tracer point analyzers from attaining complete accuracy. One of these lies in the limitations of the diamond tracer point. It is not practical to form the point so that it would be perfectly sharp and slender enough to reach into every scratch, no matter how small. Such a point would tend to catch on the irregularities of the surface and either deform them or break off.

Tracer points found most practical for general use are those having a 60 or 90 deg. diamond cone terminating in a spherical tip of a 500 microinch (0.000500 in.) radius. See Fig. 8. The Brush Development Co. supplies pickup units with tracer point radii as fine as 100 microinch, but these are practical only for the measurement of extremely fine surfaces.

Another factor limiting the accuracy of tracer point analyzers is that the skids supporting the tracer diamond in relation to the surface being measured, exert an influence upon the roughness reading. The size and the position of the skids both directly affect the reading attained, for as the diamond point is drawn over the surface, the motion of the diamond in relation to one or more of the skids rather than the actual movement of the tracer point with respect to the surface, is measured. Because of this condition, accurate standardization of tracer point measurement methods will require thorough standardization of skid size and location for varying degrees of roughness and of surface shapes.

RIGHT
FIG. 10—Procedures to be followed for making a taper section.



Furthermore, tracer point analyzers do not accurately measure surfaces having peak-to-peak distances beyond certain values. The Brush Analyzer overall low frequency response has been limited to the measurement of scratch widths up to 0.003 in. This limitation has been incorporated into the instrument in order to simplify its setup and operation for general production use, and to make possible the measurement of the radial roughness of curved surfaces, such as the working faces of gear teeth. The Profilometer cannot accurately measure the roughness of surfaces whose peak-to-peak distances are beyond 0.030 in. because the lag, inertia and damping necessary for proper averaging prevent true indications if electric impulses are infrequent.

Considering these limitations, it is apparent that precise roughness standards conforming to defined RMS values cannot be properly established by the use of tracer point instruments. Any attempt to do so necessitates the preparation of abnormal surfaces whose peak-to-peak distance is reduced to less than normal machining practice in order that they will impart a violent up-and-down movement of the tracer point necessary for the meter to give a high reading. Such abnormal surfaces, because they do not conform geometrically to defined values, are completely valueless as true surface roughness standards.

Unfortunately, some standards have already been established on the basis of tracer point measurements. In addition to creating false impressions of

surface roughness values, the adoption of such intermediate standards can lead to a very serious situation wherein individual companies and organizations throughout the whole industry set about devising their own standards and accepting them as final. This would, of course, defeat the basic objective of national standardization, which is to foster the use of roughness standards conforming to defined values based on actual measurements, rather than approximate interpretations.

Taper Sectioning

Taper sectioning was developed by H. R. Nelson of the Battelle Memorial Institute, Dayton, Ohio, in the course of surface finish research sponsored by the Norton Co. of Worcester, Mass.

Taper sectioning is a satisfactory and reliable method of studying the surface contour of metals and of checking the accuracy of tracer point measurements. Furthermore, taper sectioning provides a definite way to develop surface roughness standards conforming to defined values.

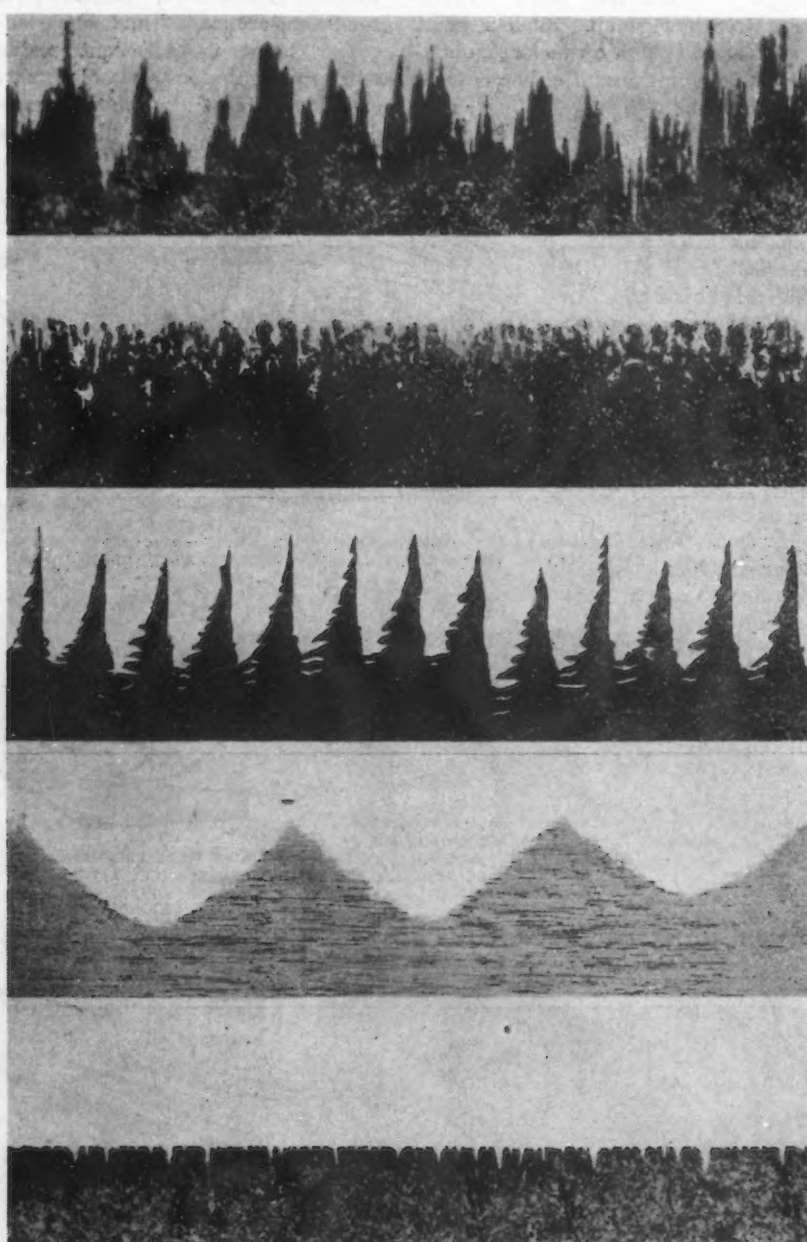
The technique of taper sectioning consists of cutting a machined surface at a very small angle with the plane of the nominal surface. The line of intersection of the plane of the cut, as contrasted to the actual surface contour, creates an apparent magnification of the depth of the surface irregularities (Fig. 9). A convenient taper angle is 2 deg. 17 min., which produces a vertical magnification of 25 times.

The procedure for preparing a taper section is illustrated in Fig. 10. When the section has been prepared, photomicrographs are taken of the area where the specimen and the nickel plate are joined.

A study of the various taper microsections shown in Fig. 11 brings out several interesting observations. Even the finely ground surface appears to be sharp, jagged, and without pattern; the lapped surface is full of pits which have been gouged out by loose abrasive grains; the turned surface shows a definite feed pitch and a repeating pattern, resulting from the shape of the tool used. The milled surface is composed of large waves, and the Superfinished surface is almost perfectly smooth except for an occasional scratch remaining from the previous finishing operation.

These taper section photomicrographs clearly indicate that different finishing processes produce different surface patterns. As two surfaces having the same RMS roughness can feel quite differently when actually compared, an accurate comparison of surfaces requires a roughness stand-

FIG. 11—Typical taper sections of surfaces, arranged in the following order from top to bottom: ground, lapped, turned, milled and Superfinished.



ard gage for each basic type as well as for each different standard.

Determining RMS Values

By definition, the RMS value is "the square root of the mean square of an infinite number of measured distances in microinches from the mean surface and normal to it, to points along the actual surface irregularities." The RMS value of any irregular surface contour curve may be determined by the method outlined in the first part of this article. By increasing the number of measurements taken, the accuracy of the determination can be increased. Such a process is at best a laborious one.

North American Aviation, Inc., has pioneered in the use of the Amsler integrator, or integrating planimeter, for determining the precise RMS values from the profile or contour curves of these surfaces (Fig. 12). These profile curves may be produced by either the taper section photomicrograph or the Brush Analyzer record tape.

With the integrator, it is possible to determine the area, the static moment, the moment of inertia, the center of gravity and the principle axes of any irregular plane surface. This is accomplished by properly aligning the instrument, reading the initial values indicated on the A, M and J dials, and then carefully tracing the outline of the surface being measured with one of the three tracers from a starting point, around the edges of the surface and back again. By calculations dependent upon the design of the instrument and the scale of the surface being measured, these values are determined from the difference between the initial and final readings on the three sets of dials. In operation, the integrator is free to move back and forth along the track while the rim of the three small integrating rollers contact the surface of the board, sliding or rolling in accordance with the movement and position of the tracer arm.

In determining the RMS value, a suitable trace length is selected (usually about 10 in.) as shown in Fig. 13. A line C-D is then drawn beneath the contour curve at any small, convenient distance parallel to the prevailing average contour. The ends of the

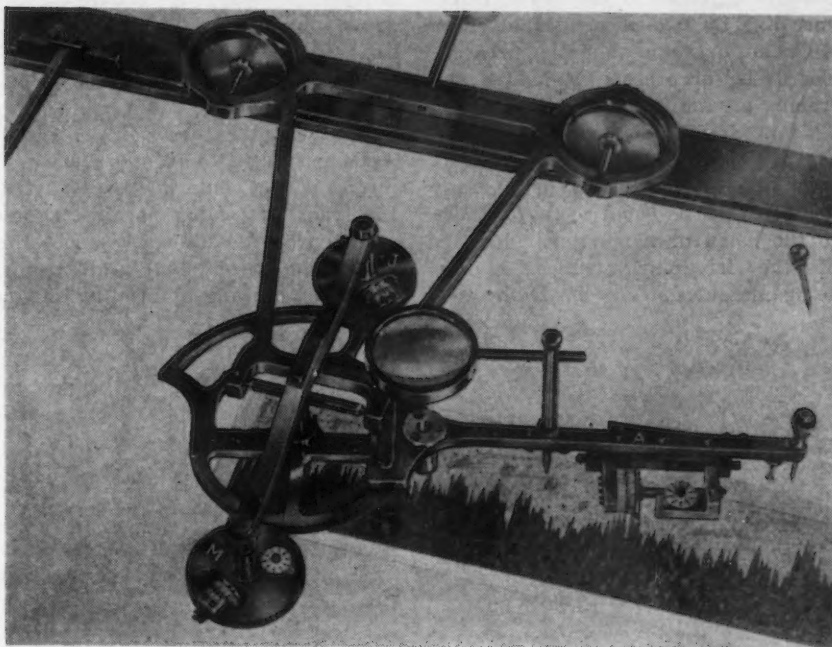
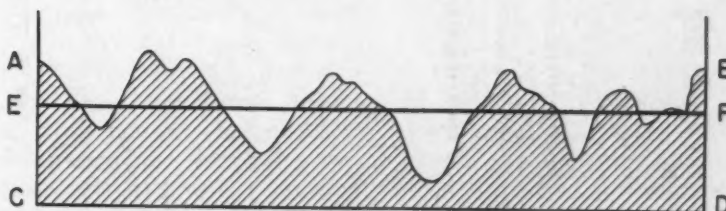


FIG. 12—With this integrating planimeter precise RMS values can be determined from any profile or contour curves.



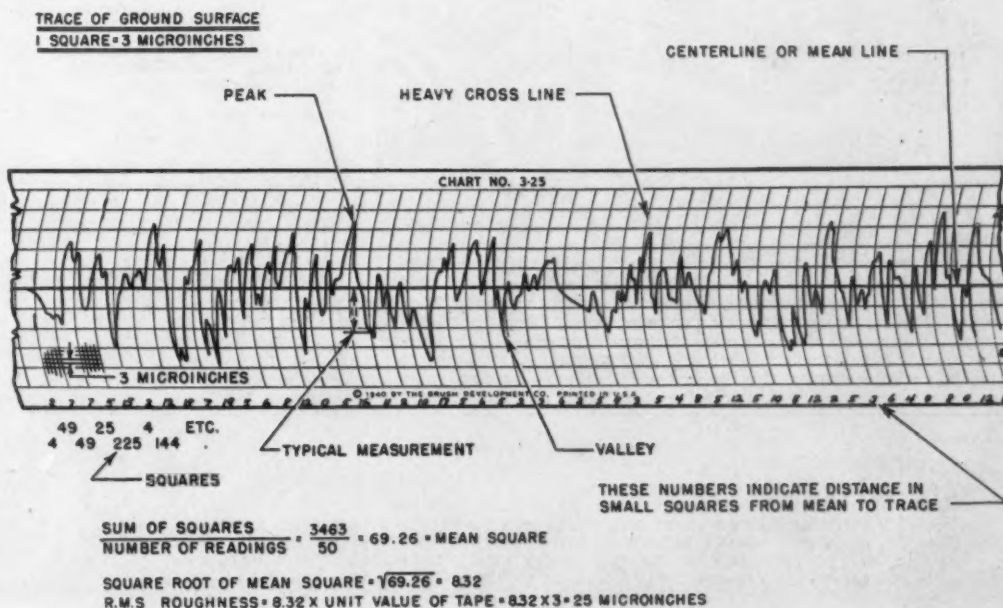
ABOVE

FIG. 13—With aid of the Amsler integrator RMS values can be determined from any irregular surface profile that may be produced by taper sectioning or by Brush Analyzer.

o o o

BELOW

Fig. 14—Sample Brush record tape showing method for calculating RMS values.



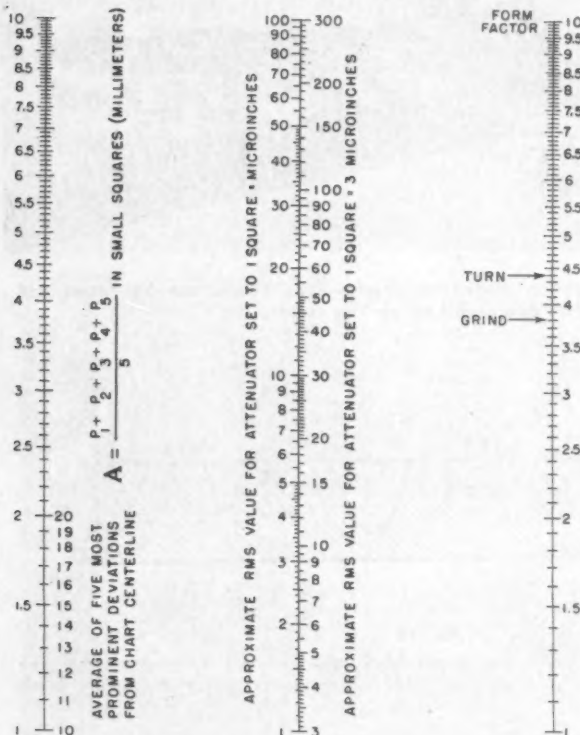
curve are joined to the lower reference line by two perpendicular lines, A-C and B-D and then the area enclosed is accurately measured by tracing around it with the integrator. This area value is then divided by the exact length of the lower reference line to determine the average height, which is equal to the distance to the mean or nominal surface line of the irregular surface contour being measured. The mean line E-F

is then drawn. By definition, this mean line should lie so that the total area of the peaks above the line is equal to the total area of the valleys below the line.

To determine the RMS value, the Amsler integrator is positioned by means of the centering gage so that the track is located parallel to and at the proper distance from the line E-F. The tracer point positioned at point E; the initial reading of the

static moment dials is recorded. In tracing the contour, accuracy is dependent upon extreme care in following the irregular line. As the tracer is moved to A and along the contour to the right, only those peaks above the mean are traced; in between the peaks, the mean line is followed. Upon reaching B, the tracer point is moved down to F and then to the left, along the mean line or the contour of the valley only, until point E is again reached. By making the proper calculations, using a value equal to the difference between the initial and final readings on the static moment dial, and making corrections for the magnification scale of the contour image, precise RMS values may be determined for a contour of any shape.

APPROXIMATE RMS VALUES FROM BRUSH ANALYSER TAPES



NOTE.

WHEN ONE SQUARE ON RECORD TAPE EQUALS 10, 30, 100 OR 300 MICROINCHES, MULTIPLY RMS VALUES GIVEN BY 10 OR 100 AS REQUIRED TO MAKE CORRECTION FOR ATTENUATOR SETTING OF BRUSH ANALYSER AMPLIFIER

LEFT
FIG. 15—Special alignment chart developed by North American for making rapid approximations of RMS values from Brush tapes.

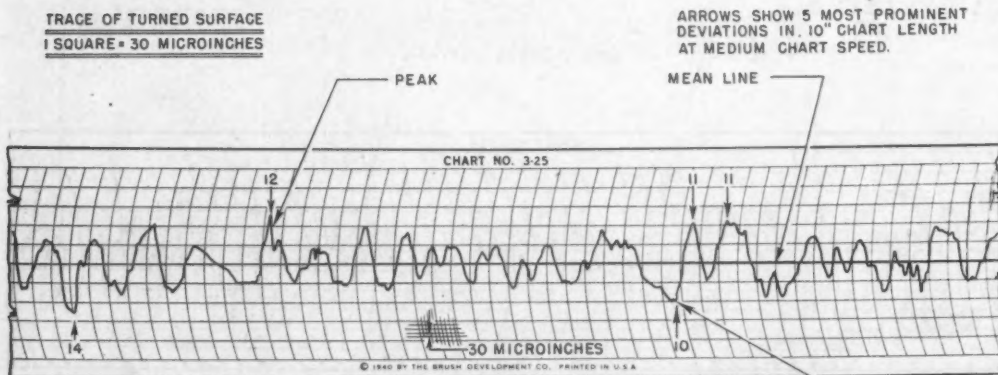
BOTTOM
FIG. 15a—Sample Brush record tape showing rapid approximation method for determining RMS values developed at North American Aviation.

Brush Tapes Measured

The Amsler integrator can also be used to determine RMS values from Brush record tapes by a procedure identical to that used in connection with taper sections. In both cases, however, the procedure is primarily a laboratory or research technique; it is much too complicated to be used in making rapid spot checks of surface roughness.

A more rapid method of determining RMS values from record tapes will be described for those who must make many such determinations. It has been proved that an experienced operator can make RMS determinations in approximately 5 min. by the use of this method.

The first step is the selection of a length of Brush record tape approximately equal to a complete cycle of operation, that is, a length of tape in which the trace follows to the point where it begins to repeat itself. Fig. 14 is a sample record tape. The repetition in the trace is caused by the slow back-and-forth motion of the tracer point over the same line of contact. For convenience in counting, a pencil line is drawn along the centerline of the tape. Using a magnifying glass, the operator counts the number of small squares from the chart centerline to the contour line at each heavy cross line. He writes these values on the edge of the tape for each of 50 intersections as shown. Each of these values is mentally squared and the



$$A = \frac{14+12+10+11+11}{5} = \frac{58}{5} = 11.6$$

ATTENUATOR SET SO THAT ONE MILLIMETER SQUARE = 30 MICROINCHES. FROM ALIGNMENT CHART, LINE JOINING A=11.6 AND "TURN" FORM FACTOR INTERSECTS R.H. CENTER SCALE AT 15.3 FOR 3 MICROINCHES, THEREFORE APPROXIMATE RMS VALUE = 15.3 X 10 = 153

squares added together. The total is divided by the number of readings taken to find the mean square. The square root of the mean square is then determined by the use of a slide rule. As the microinch value of each small square is known from the magnification used in making the trace (the attenuator setting), the mean square value, multiplied by the unit value of the small square, is the RMS value for the surface.

North American Aviation has also developed a method of making rapid approximations of RMS values from Brush Analyzer tapes by means of the

special alinement chart illustrated in Fig. 15. The procedure is a relatively simple one: A chart record, as shown in Fig. 15a, is made from the surface being measured, and a length equal to one complete cycle of the tracer arm is marked off. The centerline-to-peak distance P of the five most pronounced deviations (in terms of small chart squares millimeters) is then determined by inspection. From this, the average value A is found. A straight-edge is positioned on the alinement chart so as to join the A value on the left hand scale with the proper form factor on the right hand scale. Con-

sidering the magnification used in making the tape, the proper RMS value may be selected at the intersection of the line and the center scale.

This method of RMS computation has been developed only as a convenient procedure for making approximate roughness estimates rapidly, and is not as accurate as the more involved computation procedures described above.

This concludes the second of a three-part article. The final article will take up methods of surface comparisons by the use of surface roughness standards.

Tube Bending With Beeswax Filler

USE of ordinary beeswax has made it possible for Ford Motor Co. production men to reduce spoilage to a minimum on one L-section of aluminum tubing used in B-24 bombers manufactured at Willow Run.

Specifications called for flattening of one arm of the shape, an air blast tube with diameter of $\frac{3}{4}$ in. A stand-by filler was tried, then sand, but neither had enough "give" and the tubing was damaged. An effort was then made to flatten the part under

forming dies in a punch press without any filler, but buckling of the underside of the flattened section caused a disproportionate number of rejects.

Beeswax was then tested. It was found hard enough when solid to maintain the tube shape, yet plastic enough to extrude under die pressure. Its use in the bending operation, therefore, maintained the round shape of the one section while the other was ovalized.

Handling is simple. The wax is

melted by steam coils lining a melting pot, and the liquid is then poured, Fig. 1, into the uncorked end of the short tube. Cold water running along the trough sets the wax almost instantly. After a shaped tube is removed from the press, Fig. 2, it and others are placed in a wire basket inside a barrel. The wax is melted out of the tubes by live steam forced into the barrel, and drips to the bottom, from which it is gathered and used over again.

FIG. 1—Pouring the beeswax filler into the open end of corked tubes placed in a water filled trough.

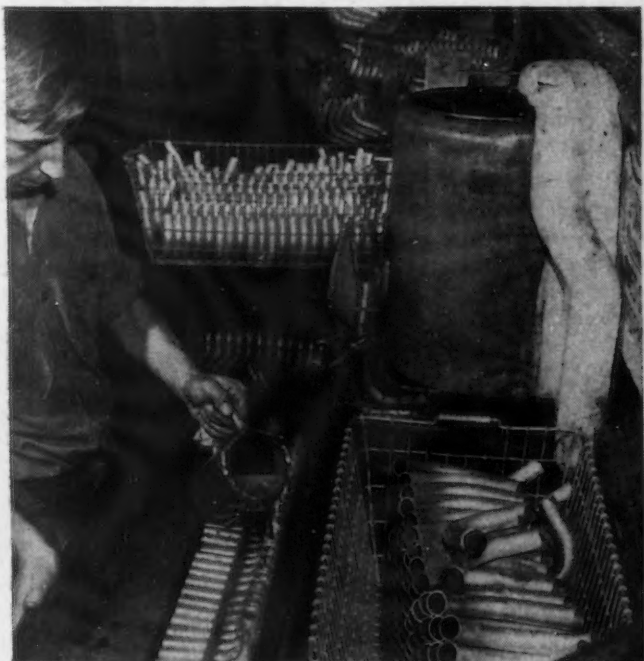


FIG. 2—Forming $\frac{3}{4}$ in. aluminum tubing in a punch press at the Willow Run bomber plant. Use of beeswax filler prevents wrinkles on the underside of the bend.



"Industrial

Precision

Castings"—

Discussion

By BENJAMIN L. LEVINSON
Vice President and General Manager,
B. F. Hirsch, Inc., New York

PRECISION casting when properly understood and applied has a tremendous future in the engineering and design of many products. In certain desirable alloys, parts have been produced by precision casting that would have been economically unfeasible by any other method of fabrication.

Many articles have appeared in the past year and half on precision casting, mostly dealing with the method of production. Certain statements made in these articles for the purpose of indicating the applicability of precision casting to industry have—from our point of view—been inaccurate and inadequate.

There appeared in a recent article the statement that castings could be

** Apparently the author refers to the article in THE IRON AGE, issue September 7, 1944, "Industrial Precision Casting by a Manufacturing Jeweler" in which appeared the following statement in question: "Dimensional accuracy within ± 0.002 in. can be maintained." Among examples of castings illustrated, the largest shown measured 3 in. lengthwise.*

produced with an accuracy of ± 0.002 in. in a length of 3 in.* Such a statement when proved by actual experience to be untrue can cause the engineer who does not have full knowledge of what actually can be done to become discouraged and to believe that precision casting has not yet graduated into production use.

Let us consider the basis for our statement that precision castings are not now being produced and cannot be produced in the near future as accurately as stated in the article referred to. In order to produce a cast-

... This critical analysis of dimensional tolerances in precision casting is opportune in view of the progress amassed in the technique within the last year and a half.

ing within that accuracy, consider how carefully the mold must be lubricated. Suppose that the mold is not closed perfectly and that it may be opened or closed tighter by 0.002 in. throughout a day's production. Consider also the fact that the wax or other fusible material used to make the patterns varies only slightly in chemical composition. The effect on the shrinkage characteristics will indeed be measurable, even if the newest injection machines and injection methods are employed. Consider the effect of a variation as small as 15 deg. F. in the temperature of the wax or other fusible materials when injected into the mold. From actual measurements of thousands of pieces a variation in temperature of 15 deg. can account for more than ± 0.002 in. in a 3 in. dimension.

Non-Uniformity in Ceramics

Consider also the ceramic material from which the mold is formed. While there are ceramics or investment material available on the market of fine quality and, commercially speaking, of uniform quality, we do not know of any ceramic that has yet been made that is so absolutely uniform that its expansion and contraction qualities can be reproduced within the accuracies required to produce a final casting within the tolerances which the article claimed.

However, suppose that all of these variables added up in such a way that one counteracted the other by luck and good fortune. Even in these cir-

cumstances, it is easy to see that when the mold is heat treated to the high temperature required, it is a very difficult matter to control that temperature day in and day out accurately enough to be sure that the mold is always used at exactly the right temperature.

A mold 50 deg. hotter or colder can throw the piece out of the close tolerance of ± 0.002 in. on a 3 in. dimension. Consider also the effect of a variation in the temperature of the molten metal itself. At the present state of development, we do not think it is practical to hold the temperature of the molten metal within a range of ± 20 deg., and unless that is done, the variation in temperature beyond this limit will cause some measurable variation in the final dimensions of the castings.

Precision casting has its limitations as has every other method of production. But it has certain virtues that are not possessed by any other method of production, and it is desired in this article to point these out.

If a part can be produced economically by the usually accepted methods of production, that is, by pressure die casting, by forging with a minimum of machining, or a screw machine, or by punch presses or other forming presses, then production of the part as a precision casting should not be thought of, unless the part so produced by the usual methods is not satisfactory and unless it is desired to obtain a part of better quality or of

(CONTINUED ON PAGE 156)

Tool Engineers Meet at Syracuse

PRODUCTION and tool control systems, method of fabricating magnesium, problems of operating branch plants in Canada, tooling problems in the manufacture of optical instruments and tool engineering education were the topics of five symposiums of related subjects which featured the 12th semi-annual meeting of the American Society of Tool Engineers, held at Syracuse, Oct. 13 and 14.

At the opening session, an electric accounting machine method for production planning, order scheduling and routing, machine loading and inventory control now in use at the Endicott, N. Y., plant of the International Business Machines Corp., was described by W. E. Crotsley, director of manufacturing control education. Where before it took the full time of 13 order clerks a whole month to schedule orders on 32,000 different items, with the automatic punched card system and electric tabulators it takes the time of only one girl for eight days to schedule 102,000 items.

From the master control cards punched from specifications and bills of materials, it is possible to produce other punched cards automatically and to obtain tabulations of many different factors. One of the features of the system of production control is the use of a so-called reservation card which is used to assure that the quantity "in stock" or "on order" is sufficient to meet future planned manufacturing. At Endicott the production planning cycle is on a five month basis, one month being allowed for order analysis and issuing orders to the factory or vendors, three months to manufacture the parts and one month for assembly.

Another feature of the system described by Mr. Crotsley was the production "explosion" system whereby the finished product is broken down first into major assemblies, various degrees of sub-assemblies and finally, parts. Through the use of electrical sorting means, it is possible for the order department to segregate those items for which there is an insufficient number on hand, after subtracting the number of "reservations" from parts or assemblies available. Orders for these parts only are then issued. Use of economic

manufacturing quantities often create overages, but the system is said to prevent pyramiding of inventories.

S. E. Lenox, assistant superintendent of the tool division of IBM at Endicott indicated that electrical tabulating machines could also be used to advantage in tool control. Through sorting and tabulating of punched cards, management is able to find out at any time the status of the following: Total commitments on each tooling project to date; the speed with which each project is progressing; whether or not the full capacity of the tool room is being utilized; actual versus estimated hours on each project; whether purchased items needed to complete tools are on order and whether the due date is satisfactory; whether the work is being spread satisfactorily among vendors; what their quality and delivery performances have been; a complete listing of tools needed first for each part (for use of expeditors); a complete history of each tool; number of tools affected by engineering changes and the total cost involved in any given period, and finally the value of the tools to be capitalized for the project.

Magnesium Fabrication

In opening the discussion on magnesium, Otis E. Grant, Dow Chemical

Co., indicated that because production of this light metal is more than ample, restrictions on its use had been largely removed. He predicted a wide extension to the application of the metal where light weight is the predominating factor, such as in transportation equipment, portable power tools, centrifugal machines and machines involving reciprocating elements where inertia forces become important. While the cost of magnesium is still comparatively high on a per pound basis, Mr. Grant stated that, taking the relative cost per unit volume of pig iron as 1, relative figures for other metals were, magnesium 4.3, aluminum 4.4, zinc 6.9 and copper 12.3.

After reviewing the various methods of manufacturing the basic metal from brines and mineral deposits, the speaker then showed a film on the working of magnesium. Much of the procedure recommendations were in conformity with those made by the two other speakers on the same program, namely, Carl J. Wiberg, supervisor, special process division, Wright Aeronautical Corp., who spoke on machining magnesium, and Max Judnick, chief engineer of Brooks & Perkins, Detroit, who read a paper prepared by E. Howard Perkins in his absence.

Magnesium is readily machinable. It can be milled up to 9000 ft. per min. peripheral speed on face milling operations and up to 5000 ft. per min. in turning, although Mr. Wiberg indicated that speeds between 150 and 1200 ft. per min. were being used at Wright. Since power requirements are low, heavy feeds and depths of cut are possible. Magnesium can be sawed at speeds up to 15,000 ft. per min. Some work is done dry and some wet. Dow recommends use of a low viscosity cutting oil. A soluble cutting oil should never be used as water only adds to the fire hazard.

Drills for magnesium sheet have a 60 deg. point angle, with the edges rounded and the web thinned to a point. Otherwise the standard 118 deg. included point angle can be used, except that for deep hole drilling (up to 25 deg.) helix angles should be increased to 40 or 45 deg. The drill point should be ground with the rake on the lip removed to show at least

DOUGLAS D. BURNSIDE
President, American Society of
Tool Engineers



a 1/32 in. flat surface at the point of the land so as to avoid the tendency of digging in. The web should be thinned to as little as 1/32 in. to permit more chip space and flutes should be polished to prevent chips jamming.

Magnesium taps very close to the actual thread size and therefore taps are selected to the high limit on the threaded hole. According to Wiberg, fine thread finish is obtained through a three-thread chamfer with 12 deg. eccentric relief, but no top clearance so as to provide a light cut on the backout. Front rake angles of 10 to 25 deg. and heel rake angles of 5 to 10 deg. have been found satisfactory. Most tapping is done with lead screw feed and with a light viscosity sulphurized (5 per cent S in fatty base) cutting oil at speeds ranging from 40 to 140 ft. per min.

Hot Forming Described

Because magnesium cold works very rapidly, stretching or forming of the sheet is difficult or almost impossible at room temperature, when the elongation is only 12 per cent. When heated to 700 deg. F., the elongation is nearly 100 per cent and hence the material is almost free from springback. Most forming and deep drawing is done between 400 and 700 deg. F. Even bending is done at elevated temperatures; otherwise much cracking is likely to be encountered.

Although the dies can be heated by built-in electrical heating elements, at Brooks & Perkins the procedure is to use gas burner rings surrounding the punch and die members, which are mounted on a hydraulic press since a slow cycle of draw is employed. Long dies tend to warp when heated and must be shimmed up to compensate. For this purpose machined sub-bases are useful. They need not be insulated from the press platens but some manufacturers prefer to do so. In some cases thermocouples placed in the dies and hooked up with magnetically controlled gas valves have been found practical, although the control of temperature is not as critical as it was once believed to be.

Cast iron is generally used for punches and rolled steel plate or Meehanite metal for draw rings. Rolled steel must be carefully normalized to prevent distortion.

Some drop hammer work is done on heated sheet, but it is preferable to mount the drop hammer dies in a hydraulic press and gradually work

the mater-down into the female die with layers of rubber on top of the sheet. A good hot drawing compound is formed by spraying on the sheet, colloidal graphite suspended in a low boiling point solvent. The latter evaporates and leaves a thin, tenacious film of graphite on the sheet which can be cleaned off later in a chromic acid dip.

The dichromate process is considered the best for protecting magnesium surfaces. After drawing, the work is first degreased then put in a hot alkaline solution, followed by a rinse and a dip in 20 per cent hydrochloric acid to remove surface impurities. The work is then immersed for 45 min. in a 15 per cent sodium dichromate solution, followed by a rinse. The chrome pickle treatment is one used at the rolling mill to protect the sheet in transit.

Canadian Branch Plants

During 18 years prior to the start of the war in 1939, Canadian industry purchased only \$55,000,000 worth of machine tools, 60 to 70 per cent of which came from the United States. From 1939 to 1943 inclusive, the Dominion bought \$140,000,000 worth of tools, most of which were general purpose types since the volume of production in Canada does not justify the mass production setups used in the United States.

In peacetime, Canadian branch plants often received "hand-me-down" machines from the American parent concern, according to W. A. Dawson, chief inspector, Otis-Fensom Elevator Co., Hamilton, Ont. He indicated that because of this factor and the fact that batch production predominated rather than line production, production costs were obviously higher, machine loading schedules more complicated and floor space utilized less efficiently than in the United States since much greater space has to be provided for work in process. On American built machines, exchange differentials, duty, war exchange tax and sales taxes add 61 per cent to the domestic base price.

Edward Kennard, vice - president and general manager of St. Catharines Steel Products, Ltd., indicated that two-thirds of the 1500 American branch plants in Canada are located in Ontario, half of them within 100 miles of Toronto. Because of high tariffs, at least 85 per cent of production is done in Canada. Most of the capital is American. Based on pre-war trends, he predicted a great in-

flux of American industry into Canada after the war. Wage rates are lower and hydroelectric power is low, \$23.75 per hp.-year in Toronto.

According to E. N. Wearn, superintendent, Canadian Acme Screw & Gear Co., Toronto, a job evaluation plan undertaken at the beginning of the war has enabled Canadian industries to pay comparable rates in various plants, but lower than American standards. In Ontario, the average weekly wage for all industry is now \$35. He presented these figures for going hourly rates in metal working shops:

Class 1 diemaker	\$1.05 to \$1.30
Class 1 toolmaker	0.95 to 1.25
Class 1 machinist	0.70 to 1.10
Punch press operator.....	0.70 to 0.90
Class 1 welder.....	0.75 to 1.00
Machine operator	0.70 to 1.00

Canada has introduced many social features comparable to those in the United States. Unemployment insurance is in effect and collective bargaining is recognized although strikes are outlawed. Transfer of workers to essential industries is under much closer control. Last summer legislature was passed giving factory workers one week's vacation with pay after a year of service. A recent innovation, for which there is no parallel in the U. S., is the establishment of an Industrial Relations Institute, through which information on the legal phases of collective bargaining is exchanged among manufacturers. A 48 hr. week has been setup except in war plants.

Instrument Manufacture

One entire session was given over to a discussion of the problems of tooling and producing a panoramic sight and range finder, by a group of executives of the Eastman Kodak Co. The design features of this optical instrument was explained by Francis M. Shull, optical engineer, while machining, assembly and testing methods were covered by Paul G. Yingling, process engineer. William R. Gordon, chief tool engineer, illustrated some of the more unusual tooling for production of the sight. Training of supervision and of unskilled workers for this work was described by Howard C. Wellman, training supervisor.

Tolerances are unusually close on this instrument which is mounted on field artillery and hence subject to gun recoil shocks. A great deal of precision grinding is done and some unconventional methods have been introduced so that as many operations as possible can be completed in

(CONTINUED ON PAGE 98)

FOR BETTER ENEMY AIRCRAFT

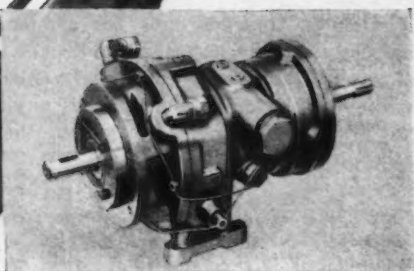


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target, and appropriate following speed. Plane evasive tactics are met by variable synchronization of the two directions of travel. Easy and speedy disengagement and re-engagement of automatic operation is also provided. These Oilgear transmissions are small, powerful, dependable.

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ARE YOU TRYING TO:

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2. Obtain automatic work cycles, variable speeds in either direction . . . with or without pre-set time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light . . . or heavy . . . forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R.P.M. or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full pre-set automatic control, elimination of problems of shock, vibration, etc.?

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Fluid Power

Assembly Line

STANLEY H. BRAMS

• Ford promises a low-priced car intended for a postwar volume leader, a \$150,000,000 expansion in facilities including two new plants and 10 new parts depots—all intended to regain first place in the industry.



DETROIT—Ford Motor Co. has trained its sights on considerably expanded postwar operations, both as to production and to merchandising. Last week saw these plans detailed at a conference of leading company officials with regional sales executives.

Here are the highlights of the Ford planning—

A new, low-priced car, tagged 20 per cent or so below the level to prevail in the Ford-Chevrolet-Plymouth range, will be introduced somewhere around six months from the time the first postwar cars are presented.

First postwar Fords will represent changes from 1942 models of the breadth customary in year-to-year design variation.

Engineering and research facilities are being coordinated at the laboratories adjoining Ford airport in Dearborn and a streamlined engineering procedure is being worked out.

At least one new assembly plant and one new manufacturing plant will be constructed.

The company in all will spend more than \$150,000,000 on reconversion and expansion, the bulk of it in plant enlargements, machine tools and other facilities.

The new lower-priced car will carry the Ford nameplate, indicating

that if successful it will ultimately replace the standard series entirely. Conceivably, it will be a car of quite different characteristics than have prevailed in the past. Rumor-ridden Detroit has heard in recent weeks that a five-cylinder, in-line engine, a laboratory project before the war, has been looked at as a possible powerplant for this new car and may be now under road test.

Manufacturing of Ford cars will be undertaken at all assembly points as soon as possible. Whether all pre-war locations will be used depends considerably on whether facilities leased or sold to the government during the war can be made available (*THE IRON AGE*, Aug. 31, 1944, p. 58). However, arrangements have already been completed for return of two of the five leased plants, at Buffalo and Long Beach. A third leased plant, at St. Louis, may be replaced by an entirely new operation there, perhaps the promised new manufacturing and assembly factories set up as adjoining facilities on ground already owned by the company. Indications are that at least a dozen assembly points or so will be available to Ford

by the time a need for volume production becomes apparent, and this number may be expanded to 16, the pre-war level, by the addition of the new facilities. Also, the Memphis plant will be enlarged by a 74,000 ft. addition costing \$500,000, permitting 30 per cent more production and 20 per cent more employment than in pre-war years. This plant, now producing P&W aircraft parts, will be completely remodeled for automotive output.

Another segment of the Ford program calls for the building of at least 10 parts depots throughout the country, several of which will provide warehouse space formerly taken up in assembly plants. Before the war there were 33 such depots; the contemplated program provides for addition of four or five more. One new one, to cost \$500,000, will be built at Denver, where ground for it has been bought.

Quite obviously, Ford is making aggressive plans. Back in 1923, in the Model T days, the company produced 2,090,959 cars and trucks, the highest total of automotive vehicles achieved before or since by any automobile company. To reach the 2,000,000-

POSTWAR POWWOW: Ford officials from factory and field spent three intense days last week talking over postwar plans and problems. This conference room photo indicates aptly the attention paid to the discussion.





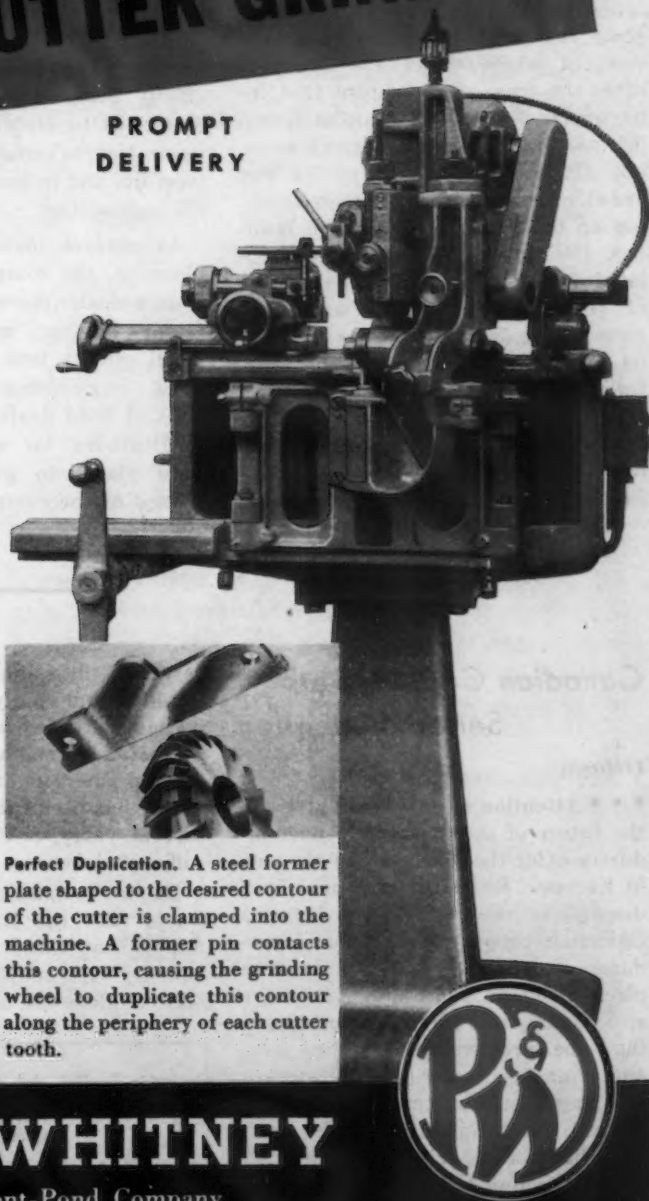
Keep 'em Sharp

with the
P&W CONTOUR CUTTER GRINDER

**PROMPT
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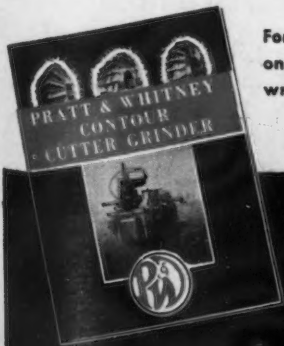
For milling odd surfaces, shaped contour cutters are in a class by themselves. They do more work, better work . . . give a far better finish. And with the greatly increased preference for these cutters has come an increased demand for Pratt & Whitney Contour Cutter Grinders.

No matter how intricate, this machine sharpens contour cutters *swiftly* and with *absolute accuracy*. Each tooth on a cutter is ground separately — to the identical contour and center distance of all other teeth. Thus, each tooth will take its full share of the cut when milling, will work more smoothly and efficiently. P&W can give immediate delivery on the Contour Cutter Grinder. And P&W can also supply contour cutters shaped to your specifications.



Perfect Duplication. A steel former plate shaped to the desired contour of the cutter is clamped into the machine. A former pin contacts this contour, causing the grinding wheel to duplicate this contour along the periphery of each cutter tooth.

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mark would be a Herculean task for any motor company in tomorrow's competitive market, even though it is vastly expanded, but Ford definitely is driving to move into first place once more in the industry, a position it last occupied in the 1937 model year.

IT may be able to do so. The sales department is echoing the confidence in the future expressed by a continually more impressive Henry Ford II, the executive vice-president, and by J. R. Davis, director of sales. There is conveyed an impression of real stability and firm direction. These company officials are frank to say—not alone for the front pages, but also out of considered thinking—that they believe America's car population will rise from prewar levels by some 10,000,000 passenger cars to a total of 40,000,000 in the 10 years after the war. They figure that industry production will come to 7,000,000 passenger cars and trucks annually after all restrictions of the war are eliminated. They base their thinking on the wartime increase in families, the amount of savings accumulated during the war, and the number of potential car owners who have come of age during the years in which no new cars were available and who, for another matter, have in that time been off to the wars.

Streamlining of the sales department has been well started, to take fullest advantage of this lush market

• • • Ford Motor Co. was revealed this week as the manufacturer of a jet propulsion engine for robot bombs, developed at the request of the Air Technical Service Command at Wright Field. Active work on this project began August 9; finished assemblies have already been used for testing purposes. Descriptions indicate the robomb is somewhat similar to German aerial bombs of the type, with propulsion caused by rapid explosions in a combustion chamber with gates at front and exhaust at rear.

The fuselage of the bomb contains the warhead, gasoline fuel, automatic control equipment and two spherical compressed air tanks to run the control units. Overall span is 17 ft. and length is 27 ft.

ahead. The program is built on efforts being made in a number of directions to stabilize the dealer organization, to bring its average quality level up, and to modernize it for most efficient selling.

As surface manifestations of this planning, the company will soon appoint a dealer committee to serve as a factory advisory group, bringing the retail outlets into closer touch with sales, engineering and production. Sons of Ford dealers will be brought to Dearborn for special training in Ford plants to give them a background of the company's manufactur-

ing and merchandising operations—something which Chevrolet has found of aid in the past in stabilizing dealerships. Beyond that, the company will shortly make available to its dealers a portfolio of suggested agency building designs, prepared by one of the leading stylists, done in streamlined modern line, even providing in some of the more fanciful variations for helicopter landing space on the rooftop.

All these developments are less significant for what they are than for what they mean. Their importance lies in the fact that out at River Rouge a new spirit of enterprise is taking shape, intensely determined to express itself in every possible manner. Two or three years ago the huge Ford empire had a faltering aspect to it. Internal morale seemed to have deteriorated. Slackness and indetermination seemed to be keynotes at the Rouge, and suppliers who depended on sales to Ford as a main prop in their business worried about the postwar. The belief was whispered that the Ford Motor Co. was drifting downhill toward a twilight. Today this appears much less a possibility. A new spirit seems quite obviously to be developing in the offices and shops at the Rouge, one of aggression and determination. It may signify that Ford will undergo a renaissance after the war of the most profound significance to the auto industry and other industry, and to the nation at large.

Canadian Copper Gets Serious Attention

Ottawa

• • • Attention is now being given to the future of the Canadian copper industry after the conclusion of the war in Europe. Recently, there have been discussions of this subject between Canadian copper producers and producers from other parts of the Empire. Rhodesia and South Africa are also participants since it is considered that the problems of Empire producers and consumers can be studied in a single series of conferences. It is learned that a number of major decisions have been arrived at.

With declining demand from Canada's largest market, Great Britain, and certainty that requirements will be drastically cut when Germany is

defeated, the Canadian copper industry looks unhappily toward a shrinking market. However, there is no prospect of a formal cut-back in copper mine production at this time. Mine output has been dropping for the past several years, merely because of insufficient labor.

Major Canadian mines had contracts with the British Ministry of Supply but these will terminate on January 31st, subject to three months' notice. Renewal, at least in part, is

under discussion at these conferences. Decisions also have to be arrived at as to tonnage, price, the disposal of surplus refined metal and the handling of present and future scrap supplies.

Price ranges discussed reflect a desire to obtain raw materials for British industries at levels such as to help restore and expand the export trade so vital to that country's recovery after the war. Thus Britain may seek somewhat lower prices than the 10.02c. per lb. called for by war contracts. While Britain has always been Canada's largest copper market, it is not the sole prospective buyer at this time. Russia and France are mentioned as possible big buyers of Canadian copper in the future. Canadian copper is a matter of considerable importance to the Dominion, because copper is one of Canada's principal exports.

Canadian Metal Production

Source: Dominion Dept. of Trade and Commerce

	Nickel lb.	Copper lb.
May	24,023,400	48,359,050
June	20,373,600	47,747,050
July	23,410,600	45,585,050
August	23,846,740	45,370,800

THREE COMMON PROBLEMS IN TOOL PERFORMANCE



WEAR TOO RAPIDLY



NOT TOUGH ENOUGH



HARDENING TROUBLES

Too frequent regrinding of a tool generally indicates the need of a tool steel with greater wear resistance. Down time for tool grinding or replacement cuts production and increases costs.

Tool breakage and crumbling of the cutting edge call for a tool steel with maximum toughness. Production time is lost and tool cost increased by tool replacement.

Hardening troubles such as cracks, excessive size change and warpage indicate the need for a steel that gives greater hardening accuracy and safety.

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THE CARPENTER STEEL COMPANY
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Carpenter
MATCHED
TOOL STEELS

• Washington and London seen planning industrialization of allied countries after the war ... Importation of American and British machinery already planned for Mexico, China, India, Russia and the British Empire.



WASHINGTON—Industrialization of allied countries after the war is being planned in London and Washington. Blue-prints for importation of American and British industrial machinery and equipment have been tentatively worked out for Mexico, China, India, Russia and most of the British Empire.

These plans would be put into effect after X-Day and would not be lend-lease, but would be some type of long term credit. Since the respective governments are dealing, it looks now that American export companies can expect transportation subsidies and look for their money from the United States Treasury.

The attraction of these plans will be great and the arguments to be advanced when the plans are made public are expected to put them over. It will be said that the price of world security lies in the industrialization of have-not allies and American prosperity for years to come can be insured by trade between governments.

There will be a few "die-hard reactionaries," may their tribe increase, who will mention the fact that the lend-lease debts of this war have little chance of being paid and that World War I debts never will be paid. Some of these men are in industry and others are in Congress. The success of their efforts to prevent the United States from becoming the perpetual Santa Claus to the world depends upon how much information is given to the public and how soon.

The idea is going around that in making reconstruction financial arrangements lend-lease agreements will be settled and it is probable that industrial products furnished for war purposes may later be sold to nations who have received them for use in rebuilding industries.

ONE early example of what is going to happen is the recently arrived-at International General Electric agreement to restore the Dneiper River dam which was demolished in the Russian retreat to Stalingrad. It will take eight years to complete the restoration.

It is now proposed that governmental trading supersede private international agreements and competitive trading—governmental instead of private cartels since the elements of quotas and price fixing all undoubtedly appear. Governments will trade with each other instead of individual companies. At least these are the plans.

Subsidies for merchant shipping are part of the pattern sought by the administration to insure full employment, the theory being that a large number of men can be kept at work

in a continuing big shipping industry. American shipyards will replace worn out United States ships as well as build them for foreign nations.

Theoretically, also, since much of the excess capacity of American industry will be taken up in foreign trade, which is hoped to be three or four times the peacetime volume of \$2,000,000,000 to \$3,000,000,000, domestic industry will profit and thousands of workers will have jobs.

This type of foreign trading is looked upon by some government officials as a manifestation of the Four Freedoms—freedom from want. Others think it a short cut to reducing the American standard of living to that of the rest of the world.

SUBSIDIES, extension of credit and meeting foreign competition by future agreements on exchange as agreed to at the International Monetary Conference at Bretton Woods will be the cost to the government. It is claimed that this will be largely offset by increased income to American producers and workers and the increased revenues they will be able to pay to the government.

At the Bretton Woods conference it

MANILA BOUND—A carrier of the Essex class, its flight deck crowded with planes, churns its way through the waters of the Pacific to participate in the Sept. 21 air assault on Manila and other targets in the Philippines.



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was agreed that exchange quotas should be assigned to each country and that each country should furnish 10 per cent of its own gold reserve, or 25 per cent of its quota in gold whichever is the lower. From this world bank, then, foreign countries would be able to purchase dollars to the extent of their quotas.

The joker is that countries would be permitted to substitute their currencies for gold reserves, thereby permitting them in effect to make overdrafts and purchase more dollar exchange than their credit would normally justify.

This in turn would normally deflate the value of the dollar in foreign currencies and eventually, many trade experts think, result in further depression of the value of the dollar in the United States.

It follows that under this scheme foreign countries would be able to purchase much more from America than ever before and the chances are that this country will become the chief exporting nation in the world for a while because the United States has greatly excessive production machinery and greater numbers of skilled workmen than anywhere else on earth.

Great exports of productive machinery will necessitate more than one major adjustment of world tariffs as is now planned, some government men foresee. The State Department in this

grand global planning proposed to permit countries to make the things that they can most economically. This means to a greater extent perhaps than anyone now imagines, high cost production in many countries will be abandoned. At least this is the thinking.

ON the other hand, a practical pessimism is growing up in some quarters concerning the industrialization of backward countries such as China and India. The difficulty is that there is no huge available source of manpower which can be readily trained to mass production methods. Furthermore the many and varied dialects and tongues spoken in these countries constitute what many experienced Far Eastern industrialists term insuperable handicaps. This has been the story in the past.

Part of this fancy postwar horse trading will be in consumer durables. While Great Britain is urging synchronization in the reconversion of the United States and the United Kingdom, American friends of the British are pleading that reconversion be based on "equal sacrifice," according to ratio of consumption. Already, the Combined Production and Resources Board is thinking in terms of a "realistic" adjustment of lend-lease policy after X-Day.

British foreign experts are saying,

it is reported, that England cannot reconvert and recover from the effects of the war without substantial assistance from the United States.

* * *

It is reliably reported that a new protocol has been proposed, if not signed, with the Russians to ship 600 locomotives in the 1944-45 period to the Soviet. Russia is also said to be negotiating for diesels and it is not known whether 600 power units will include diesels or not. The reason for the new agreement is said to be because this number of locomotives was dropped from the Russian program last year.

McNutt Solicits Help Of Local Labor Leaders In Manpower Shortage

Washington

Local management and labor leaders were urged to exhaust every community resource in meeting labor requirements for critical war production before resorting to recruitment in other parts of the country in a statement by Paul V. McNutt, chairman of the War Manpower Commission, recently.

Such action, he said, will serve the twofold purpose of speeding production and reducing the dislocation of workers resulting from interregional recruitment.

Mr. McNutt called upon area management-labor committees throughout the country to aid especially in negotiating transfers of needed workers from non-war industries and in removing causes of turnover in war plants in 95 areas where manpower shortages are critically significant to prosecution of the war.

"It is the policy of the commission," Mr. McNutt said, "to assist each community or area to supply the labor demands of its own war plants to the utmost degree possible. The full resources of the area management-labor committee should be used in solving the area problem."

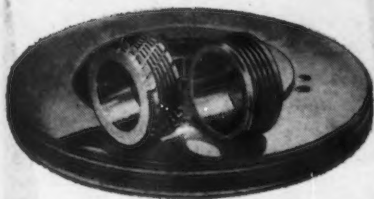
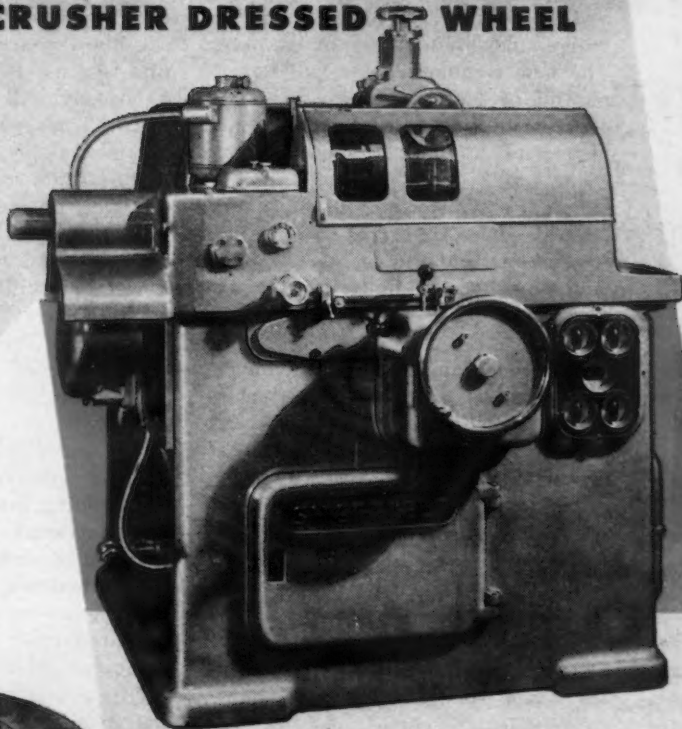
Mr. McNutt said he was acting on the recommendation of the National Management-Labor Committee of WMC, which reported that while interregional recruitment has helped to meet essential manpower requirements, it is felt that with the assistance of regional, state and area committees, a great deal more could be done to reduce the necessity of large migration by recruiting the needed personnel from among those not employed in war industries.

THE BULL OF THE WOODS

BY J. R. WILLIAMS



THREADS and FORMS *PLUNGE GROUND* WITH CRUSHER DRESSED WHEEL

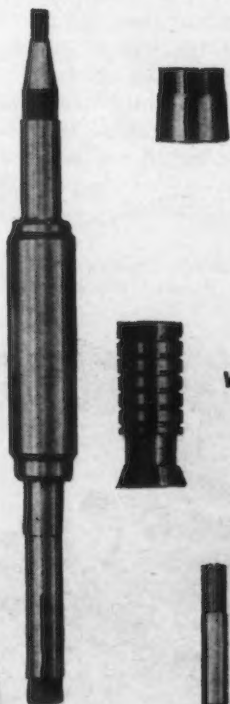


The crusher dressed multi-ribbed grinding wheel offers important savings in both time and production costs in grinding precision threads and circular form or profile work.

In a plunge cut with such a wheel on the Sheffield Thread and Form Grinder, a single or multi-start threaded section, the length of which does not exceed the thickness of the wheel, is completed in $1\frac{1}{2}$ revolutions of the work part. For larger parts traverse grinding is used.

Wheels are crusher dressed in a small fraction of the time it takes by conventional methods and they have more effective cutting surfaces. Furthermore, the multi-ribbed wheel stands up longer.

Write for technical bulletin.



• Labor shies away from automatic welder . . .
New galvanizing plant opens in Northwest . . .
Shipbuilders define repair work in master contract.



SEATTLE—What to expect from labor displacement due to technological developments evinced itself at the Todd Pacific shipyard here last week with a wildcat walkout.

Todd Shipyards recently installed a Union Melt automatic welder to speed up production on its straight line welding operations. The yard canvassed its personnel to find a man trained to operate the new automatic welder, and enlisted the cooperation of the union shop stewards toward the same end. No qualified man was found on the payroll, so the company brought a man with the rating of leadman from Tacoma.

The welding crews checked in the following day but did not go to work. At a union meeting held later in the day, union officials warned the men that the Navy could not investigate while they were off the job, and that any work stoppage was unauthorized.

The following shift reported to work as did the original group on the succeeding day. Some observers feel, however, that reasons for the stoppage may have been more deep seated than the stated reason.

* * *

Boeing Aircraft plans that between now and the first of the year its entire production will be concentrated on the B-29 Model in all plants, including two new branches at Hoquiam and Everett.

Although actually an enlargement

of an original plant there, the Everett addition is rated as a new plant and will employ 400 people by January. The new Hoquiam plant will have a payroll of 500 employees. The Tacoma plant, with the largest branch payroll of 1350, will be increased to 1500.

Boeing's Vancouver, B. C., plants have also been converted to B-29 production. Originally set up to build B-17 parts, these plants are now being rapidly converted to B-29 construction.

Imminent completion of the conversion program will swing the entire Boeing production to the Superfortress, both on the Pacific Coast and at Wichita.

* * *

Isaacson Iron Works have installed a new galvanizing operation in their Plant 2 location. One of the most modern and well equipped in its field, this plant is another important addition to the metal industry facilities of the Northwest.

Equipment includes one of the largest electrically heated kettles in the industry. Using the hot-dip process, the tank's inside measurements are 50 x 60 in. by 32 ft. long. It has plate steel lined and 13-in. brick walls and is heated in three zones with a capacity of 822 kw. each. This heating method is designed to keep temperatures uniform and compensate for the entry of the cold metal into the hot zinc.

The main building housing the galvanizing unit measures 75 x 272 ft.

and has a 30 x 80 ft. annex. In addition to the electric galvanizing kettle the plant has six steam-heated pickling tanks 5 ft. wide, 6 ft. deep and 42 in. long. All tanks were fabricated in the firm's own structural steel department.

Innovation in the plant's design is piping sulphuric acid from a 1300 gal. tank to the pickling tanks.

The annex houses two Pangborn Roto-Blast units to clean castings and forgings before being galvanized, and a Tolhurst centrifugal machine has been installed to throw off excess zinc after galvanizing small pieces.

The entire work area, including a railroad spur running the length of the building, and two truck unloading platforms, is served by floor-operated overhead cranes.

The building and the layout of equipment were designed for straight-line production of a wide variety of products. It is equipped to handle anything from small bolts to power line structural steel.

To avoid work stoppage, management and employees swung into production in the new addition without the traditional opening ceremonies.

* * *

Northwest Steel Rolling Mills have recently cut their operations from two shifts down to one because of critical manpower shortage, according to company officials.

Until recently the company employed a payroll of 250, which is now reduced by 50 per cent. Officials of

MUDDY ITALY—A Bulldozer is sent out on salvage work in the mud, after a heavy gale swept the Marecchia River area, flooding the river and turning the countryside into a quagmire.



Foundation:

STUMBLING BLOCKS

Gigantic dams and mighty bridges of tomorrow will rest on a foundation laid years ago. This foundation, the capacity of a top flight engineer for learning to recognize and how to deal with stumbling blocks, grows firmer through the years. Today this man brings to important construction projects more than can be found in books: he brings insight born of specific accomplishment.

Specific accomplishment in the design and manufacture of industrial clutches also highlights the 26-year-old career of the Twin Disc Clutch Company. Here too, stumbling blocks have been turned into firm foundations on which to build better, more dependable clutch performance.

If your important projects are machines with both driving and driven units, here are three aids to most satisfactory power transmission and control that you can get from Twin Disc. (1) Application experience to make *sounder* analyses of your clutch needs. (2) Specialized knowledge of materials and processes to make the best clutches. (3) A nation-wide service organization of factory branches and service stations.

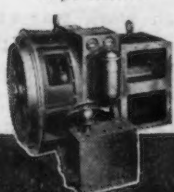
Money spent on power links buys more the moment you enlist these Twin Disc aids. More for your money—in friction clutches or hydraulic drives—is the foundation for better value in your machines. A resume of how Twin Disc can help you is yours for the asking. Write us today at either of our plants. TWIN DISC CLUTCH COMPANY, Racine, Wisconsin (Hydraulic Division, Rockford, Illinois).



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CLUTCHES AND HYDRAULIC DRIVES

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SPECIALISTS IN INDUSTRIAL CLUTCHES SINCE 1918

the firm hoped this changeover would enable them to hold the bulk of their business, but the critical labor shortage has necessitated contract cancellation and turning down new orders.

Output of the firm at present consists principally of merchant bars for shipyards.

The management attributes the situation to low wage rates and states that it is getting by with "temporary employees." The firm pays prevailing ceiling wage rate.

* * *

SAN FRANCISCO—After five lengthy, wordy conferences at San Francisco, Seattle, and Portland, over 15 months' time, attended by several hundred representatives of labor, management and government war branches and agencies concerned, the master agreement covering new ship construction between Pacific Coast shipbuilders (except southern California) and the Metal Trades Department of AFL and the Pacific Coast District Metal Trades Council has finally been amended to eliminate recurrent misunderstandings, difficulties, beefs, work stoppages and hard feeling over what is known as the repair rate differential.

It is now provided that a new vessel shall be construed to be any newly constructed floating structure prior to its completion and delivery to the owner. Construction of new vessels as differentiated from repair shall include substantial rebuilding of a vessel prior to completion and delivery. But when a new vessel is placed in or on dry docking facilities of a repair or combination yard, all work concerned with substantial rebuilding shall be repair work and therefore the workers will be entitled to a base rate of \$1.34 per hr., the repair rate, instead of \$1.20 per hr., the new construction rate. This does not prevent the employer from continuing to perform new construction work on such a vessel while in dry dock by new construction workers at the lower new construction rate.

The amendment in substance eliminates the old requirement that a vessel is new until it has been completed, finally accepted and completed a voyage, either cargo or passenger laden for the purpose for which it was built. Because of this provision in the old agreement, government accountants insisted that all workers on every new vessel be paid at the new construction rate. Dry dock workers and ship repair men in combination and repair yards were paid \$1.34 per hr. most of the time and had to ac-

Cited for Awards

• • • The following companies have received the Army-Navy "E" for outstanding war production:

E. I. du Pont de Nemours & Co.'s Perth Amboy plant, Perth Amboy, N. J. (second star)
 Macwhyte Wire Rope Co., Kenosha, Wis. (second star)
 Silent Hoist & Crane Co., Brooklyn (third star)
 Star Drilling Machine Co., Akron, Ohio.
 Allen Wales Adding Machine Corp., Ithaca, N. Y.
 Day & Zimmermann, Inc., Iowa Ordnance Plant, Burlington, Iowa.
 Farah Mfg. Co., El Paso, Tex.
 General Motors Corp., Hyatt Bearing Division, Clark Township Plant, Rahway, N. J.
 La Crosse Trailer & Equipment Co., La Crosse, Wis.
 Marshall Chemical Warfare Service Plant, Moundsville, W. Va.
 Minneapolis-Honeywell Regulator Co., Aero Division, Chicago.
 Nolde & Horst Co., Reading, Pa.
 Northwestern Leather Co. Trust, Northwestern Leather Co., Soo Tannery, Sault Sainte Marie, Mich.
 Pharis Tire & Rubber Co., Plant No. 2, Newark, Ohio.
 Photo Utilities, Inc., New York.
 Odenbach Shipbuilding Corp., Rochester, N. Y.
 Scullin Steel Co., St. Louis.
 Sta-Rite Ginnie Lou, Inc., Plant No. 7, Shelbyville, Ill.
 Truck Engineering Corp., Cleveland.
 Vita Var Corp., Newark, N. J.
 Westinghouse Air Brake Co., Union Switch & Signal Co., Swissvale, Pa.
 Ypsilanti Reed Furniture Co., Ionia, Mich.

cept \$1.20 per hr. when they happened to be working on a new vessel that was being modified and happened to be drydocked.

The lion's share of credit for finally accomplishing this seemingly sensible and obvious agreement should be credited to Paul R. Porter, chairman of the long-drawn-out conference, representing the War Production Board and chairman of the National Shipbuilding Stabilization committee. Work involved is comparable to that performed in a modification center in the aircraft industry, consisting of minor alterations and topping off, sometimes ordered by the skipper and sometimes necessitated by last-minute changes by the Service to which the vessel is assigned. It is estimated that it only affects from 2 to 10 per cent of the time of repair workers in repair and combination yards.

Although CIO unions are not party to the agreement, they will undoubtedly be covered and benefited by its effect, when approved by the War Labor Board in Washington.

Strangely enough, no repair differential is paid by shipyards in southern California since, by a ruling of the War Labor Board, it has been held that the original so-called Pacific Coast master agreement covering new ship construction between shipbuilders and ALF Metal Trades men, and an accompanying Pacific Coast ship repair agreement does not bind southern California management. When the original agreement was signed, the southern California yards were not separately represented and there was little ship repair in southern California at the time. This may become a sore point as time goes on and as more repair work is done and more workers receive \$1.34 per hr. base pay at San Francisco, Portland, Seattle and all Pacific Coast ports except Wilmington-San Pedro-Long Beach and San Diego.

In the interminable conferences that developed this seemingly simple and obvious compromise, for which the government, as usual, pays the bill, it was apparent again that bitter rivalry and enthusiastic misunderstanding between CIO and AFL Pacific Coast leadership in metal trades and shipbuilding unions were, and will continue to be, principally responsible for whatever work stoppages, jurisdictional disputes and headline controversy that have occurred.

USWA Strike Hinders Vital War Production

Niles, Ohio

• • • The production of bogie wheels for tanks and the shipment of bomb cannisters are being seriously handicapped due to a strike of 28 members of the United Steel Workers of America, C.I.O., at the Niles Steel Product plant, Niles, Ohio, of Republic Steel Corp.

The strike is in direct violation of the contract between the company and the union and was called without filing any grievance with Republic.

Twenty-two employees of the bogie wheel line stopped work in an effort to secure a higher rate for the production of this essential war product on which work was started only a few days ago. No written grievance was filed by the union prior to the strike.

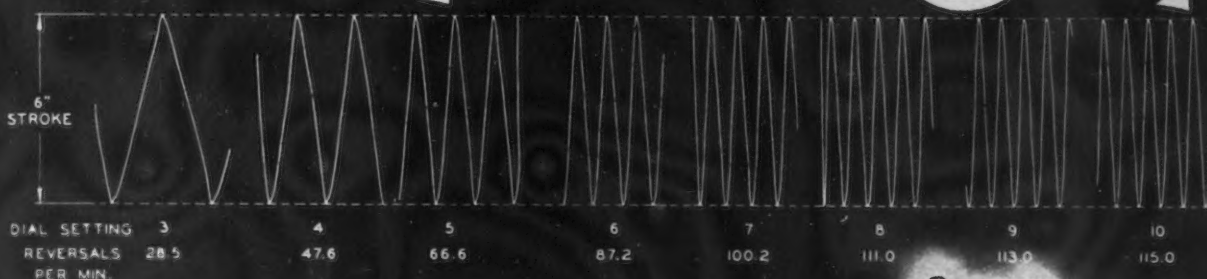
Six employees in the shipping department, whose job it is to load bomb cannisters into freight cars, struck to enforce payment of an incentive pay rate which rate has been submitted to the War Labor Board for approval.

For Machines Requiring Continuous Reciprocating Cycles:

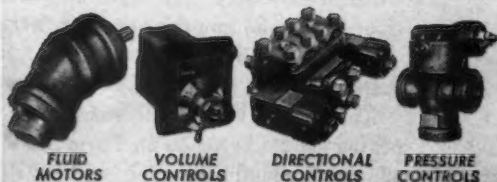
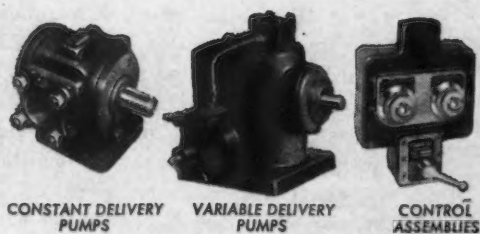
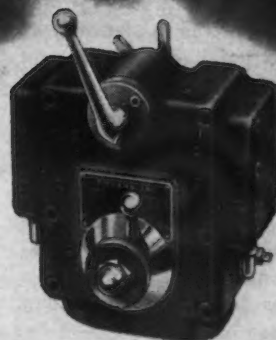
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Note Uniform Length
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This is a complete self-contained control unit for grinding machines, honing machines, or any process requiring a continuous reciprocating cycle.

The curves reproduced above were accurately made by a stylus attached to a reciprocating head and tracing upon a recording mechanism. Note uniform stroke length regardless of large changes in head or table speed. Throughout the test the setting of reversing trip dogs remained unchanged. An integral Vickers Hydrostatic Compensator makes flow rate (and therefore rate of reciprocation) independent of variations in resistance encountered. Similar tests and many installations show that at other speeds, loads and stroke lengths the same smooth reversals and accurate stroke length control are maintained.

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Tool Engineers Meet at Syracuse

(CONTINUED FROM PAGE 84)

a single chucking. These include a means for press fitting a Zerol bevel gear in a housing so that the bore can then be ground concentric with the o.d. surfaces at one setting. Indexing errors on a worm gear must be held extremely close and an ingenious instrument, including a 100 X microscope, has been devised to check tooth spacing. Backlash between the Zerol gears and the mating bevel pinion likewise is held to a low value.

Tool Engineering Education

One of the most provocative sessions was devoted to a discussion of tool engineering education and related apprenticeship training. Dr. Mark Ellingson, president, Rochester Institute of Technology (formerly Rochester Mechanics Institute) indicated that a two-year program in tool engineering was being planned for the fall of 1945 with the assistance of the ASTE national education and training committee, headed by Otto W. Winter, vice-president, Acme Pattern & Machine Co., Inc., Buffalo. It will be a cooperative program incorporating the principles that work experience is real education. The course will not be too highly vocational in character and will train for a class of jobs in industry rather than narrowly defined jobs.

Criticizing present concepts in engineering education, Dr. Ellingson deprecated the lack of coordination between conventional college curricula and the needs of industry. Because a survey he made had indicated that only 5 to 10 per cent of engineers actually apply higher mathematics in their work, the proposed course in tool engineering will have much fewer hours devoted to this work and to theoretical mechanics. The speaker suggested that the functional aim of all engineering curricula be re-examined in the light of actual needs of industry.

Since the lack of skilled workers will be an even more serious problem than now in the reconversion period ahead, W. F. Patterson, director, apprentice training service, WMC, Washington, stated that apprenticeship is needed more today than ever before. The median age of skilled labor in the machines trade group in 1930 was 34.6 years; in 1940, it had risen to 38.1 years, indicating

that too few young men had been trained as skilled craftsmen. He urged that tool engineers lend their technical skill to setting up apprentice programs, which should tie in with the whole manufacturing scheme rather than being an outside activity of the personnel department. Despite the inroads of Selective Service, in numbers of plants having approved plants, apprenticeship has gained 25 per cent in the last year, there now being 30,000 shops in the country with such plans in effect.

Mr. Patterson estimates that under the provisions of the "GI Bill of Rights" probably 100,000 carefully selected returning war veterans will be absorbed into the ranks of apprentices. They will receive the same government financial aid accorded a veteran returning to college to complete his education.

Tying in apprentice training with tool engineering, L. J. Fletcher, Caterpillar Tractor Co., in a paper read in his absence by E. M. Bertschi, training supervisor, declared that a good machinist apprentice course in which shop experience on production machines as well as in the tool room and in tool design is tied in with related shop mathematics, physics, drafting, metallurgy, production planning and the like, furnishes an excellent foundation on which to build a professional career in tool engineering. Supplementing the shop courses should be outside study in engineering fundamentals on a higher level. He urged that the local chapters of the ASTE encourage the setting up of apprentice student chapters so that these young men will feed into the organization later on.

In closing the session, Mr. Winter revealed that incomplete tallies from a questionnaire recently sent to industrial executives indicated that 84 per cent of those replying thought that tool engineering should be set up as a separate branch of engineering. The majority favored teaching such a course on the full college level rather than in technical institutes (25 per cent). Over 85 per cent favored the cooperative system and all wanted to see more practical teaching introduced. An apprenticeship prerequisite was favored by 46 per cent, while 66 per cent thought the student should be a graduate of a technical or vocational high school.

Speaking on the subject of "Engineering for Peace" at the closing banquet session, James Y. Scott, president of the National Machine Tool Builders Association and of the Van Norman Co., Springfield, Mass., indicated that although more special purpose tooling will have to be used after the war in order to produce goods at lower costs, many general purpose machine tools will have to be retooled during the immediate reconversion period. Not only will the new machines be unavailable at once (for four years there was no chance for the builders to do any development work) but the swing-over will be in small doses where the quantities involved will not warrant special purpose equipment. This situation, Mr. Scott said, will present a great challenge to the ingenuity of tool engineers. "After top management has made the major decisions as to the release of peacetime products, there will be only hours to work in when the ball is passed to the tool engineers. You won't have six months to do a fancy job of retooling," the speaker said. He predicted that eventually postwar models of machine tools would cut costs by 50 per cent.

Douglas D. Burnside, president of the society presided at the banquet and the semi-annual membership meeting.

Facilities May Apply For Non-Necessity Certificate

Washington

• • • Having the effect of terminating the amortization period with regard to any affected facilities, WPB has announced that a so-called "non-necessity" certificate may be applied for by a person who owns facilities that have ceased to be necessary in the war effort and in connection with which a necessity certificate has been issued, may be amortized over a period ending with the date specified in the certificate.

Application for non-necessity certificates should be made on Form WPB-3984 and should be filed with WPB in Washington. Application forms may be obtained from any WPB field office or from Room 1501 Social Security Bldg., Washington.

WPB pointed out that these provisions are made under Section 124 (d) of the Internal Revenue Code as modified by Executive Order 9486 issued by the President.



J. B. KINTNER, vice-president, Union Steel Castings Division, Blaw-Knox Co.

• **J. B. Kintner**, who has been associated with the Union Steel Castings Division of the Blaw-Knox Co., Pittsburgh, for the past eight years, has been promoted to vice-president of the division. Mr. Kintner joined the division in 1936 after an 11-year association with the American Rolling Mill Co. For the past year he has been manager of sales.

• **C. E. Plass** has been appointed district engineer in the electrical sales division of the Chicago office of American Steel & Wire Co., subsidiary of U. S. Steel Corp. **Victor Siegfried** has been named to succeed Mr. Plass as chief research engineer of the Electrical Cable Works at the company's South Works in Worcester, Mass.

• **Charles W. France**, Curtiss-Wright vice-president and general manager of the Airplane Division Buffalo plant has returned to St. Louis as general manager of the plant. **N. F. Vanderlipp**, factory manager of the Columbus plant, has succeeded Mr. France as general manager at Buffalo. **Burton H. Witherspoon**, general manager of the St. Louis plant has been named director of business research at Buffalo, succeeding **Dr. Donald H. Davenport** who has resigned to accept another position. **Ralph A. Fuhrer** has been made factory manager at Columbus.

• **Carl E. Lang** has been appointed district manager of the New York office, Yale & Towne Mfg. Co., Stamford, Conn.

PERSONALS

• **E. M. Richards**, assistant vice-president in charge of operations, Republic Steel Corp., Cleveland, has assumed charge of the operations of the company's steel districts, succeeding **Howard B. Carpenter**. Mr. Carpenter, who has been with the company for 16 years, has resigned to open an office in Cleveland as a consultant in steel mill operations. **W. M. Kelley**, formerly works manager of the Youngstown plant of Truscon Steel Co., a Republic subsidiary, has been appointed assistant to the vice-president in charge of operations and will have charge of the company's manufacturing divisions. **Peter Robertson**, assistant chief industrial engineer for Republic, has been made works manager of the Youngstown plant succeeding Mr. Kelley.

• **Joseph G. Magrath** has been appointed manager of the Chicago district sales territory for American Machine & Metals, Inc., East Moline, Ill. Mr. Magrath has recently been sales engineer and merchandising manager for Air Reduction Sales Co., New York.

• **Austin F. Palmer**, formerly superintendent of shell production, Eclipse Machine Division, Bendix Aviation Co., Elmira, N. Y., has joined Giebel Machine Tool Co., New York City office, as a sales engineer. **James N. Davies**, formerly chief tool designer of Towmotor Corp., Cleveland, has joined the company as a sales engineer in their New Haven office.

WALTER H. WIEWEL, assistant to the president, National Tube Co., as announced in *IRON AGE*, October 12.



JOHN S. HUTCHINS, executive vice-president, Ramapo Ajax Division, American Brake Shoe Co.

• **John S. Hutchins** has been appointed executive vice-president of Ramapo Ajax Division of the American Brake Shoe Co., New York. Mr. Hutchins assumes this newly created position after serving as vice-president in charge of sales for the division since January 1. He has been with Brake Shoe for 19 years.

• **John J. Buckley**, formerly with Superior Tube Co., Norristown, Pa., has been elected vice-president and resident chief executive of the Pacific Tube Co. at Los Angeles. **W. P. Armstrong** has been appointed sales manager of the company, succeeding **Jack Manildi**, recently resigned.

• **R. L. Wilcox**, who has been with the Conservation Division, WPB, since March, 1942, most recently as chief of the metals branch, will return to the New Jersey Zinc Sales Co., Inc., New York, November 1, and will be located in the Chicago office. Mr. Wilcox was loaned to WPB by the company for work in connection with various problems concerning both zinc and cadmium. He was also government presiding officer of the Die Casting Technical Industry Advisory Committee and acted as special consultant to the zinc and copper division.

• **John D. Gordon** has been appointed general sales manager, Progressive Welder Co., Detroit. **K. Swanson** and **W. Kaiser** have been named chief engineer and development engineer respectively. **T. E. Kirchner** and **J. A. Gable** have been appointed to the field sales staff.

Fatigue Cracks . . .

BY A. H. DIX

High Flying, Ardent Reader

• • • To that vivid close-up of Robert G. LeTourneau, the earth-moving equipment genius, in last week's *Life*, should be added this postscript of Roland S. (R. G. LeTourneau, Inc.) Neff's:

While flying with Mr. LeTourneau from our Vicksburg, Miss., plant to a speaking appearance he fulfilled in Evansville, Ind., I counted not one but five copies of *Iron Age* in the cabin of his Lockheed-12.

When he is not concocting new ideas and inventions, or preparing speeches, you can almost bet he'll have a copy of *Iron Age* in his hands up there. He is one of your most ardent readers.

We think that *Life* readers are entitled to know the part your favorite family journal plays in fueling the teeming LeTourneau mind, and we have so written *Life*. But our letter will probably not be published, as a publisher rarely blows another's bugle. We are therefore forced to overcome our own aversion to boasting by airing Mr. Neff's remarks here, so that the world, or more specifically this page's loyal army of eighteen readers, will know that we are front row center in the LeTourneau heart.

We Toot Another's Bugle

• • • Being less selfish than the average, we are not opposed to giving a contemporary a plug. As proof, you see below a picture of the *Oil and Gas Journal's* brains department in conclave assembled with P. C. Lauinger, president, who is the gentleman nearest you.



This is a sneak photo sent to us by our spy on the Tulsa publication, who supposed we would be interested because of the copy of your favorite family journal in the foreground. We are interested, subject to the condition that our presence at the meeting was that of an exemplar of all that is noble in industrial publishing.

Will our own brains department please note that among the *Oil and Gas Journal* editors there is no fingering of moles, no staring out of windows, no whispering the one about the soldier with the one-hour furlough, and observe also that each is armed with the weapon of his craft—in ready position. It is a scene to arouse admiration and envy.

Worm Makes Grade

In your fast infield combination Col. Oveta Culp Hobby, Dr. Icie Macy Hoobler, and Dingle Mackintosh Foot, surely there is a place for A. Toxin Worm, perhaps at third base. He is or was a famous theatrical press agent.

—C. E. Brown,
Fuller & Smith & Ross, Inc., Cleveland

A. Toxin Worm is elected a member of the Distin-

guished Name Club. Of course, with Worm as a family name he had an ace in the hole to begin with, but he had it within his power to achieve cognominal mediocrity by signing himself Albert T. Worm—if Albert was his given name—and mar a gem.

Only a Quarter Harvard

Anent your remarks about Hans Klagsbrunn of the RFC, no doubt his pronunciation of negotiate (nee-goe-see-ate), assuming that it was a mis-pronunciation, is due to the fact that he spent that one year at Harvard.

Otherwise he was a Yale man of the Class of '29 and of the Yale Law School and Class of '32.

Which reminds me of an apocryphal story. It is reported that a Boston newspaper once carried this advertisement:

**Wanted for responsible position—
Harvard man or equivalent.**

A Yale man answered:

"In regard to your advertisement: Do you mean two Dartmouth men or one Yale man working half time?"

—Wm. Horowitz, Vice Pres.,
Botwinik Brothers, Inc., New Haven, Conn.

Retreat with Grace

After checking dictionaries from both sides of the Atlantic in an attempt to prove you wrong, I must acknowledge defeat.

I only hope that I do it better than I say it.

—Hans A. Klagsbrunn, Deputy Director
of War Surplus Property, RFC, Washington

Metal Congress Minutia

• • • We suppose the brains department will provide you with adequate reports of the National Metal Congress, so we will merely report that the cigarette shortage in Cleveland was such that there were lines of waiting buyers reaching clear out to the sidewalk. We would also like to mention that Cleveland's hotel facilities were augmented by the "Greater Detroit," a large ship on the Detroit-Cleveland run. We slept on the "Greater Detroit," and found its acoustics excellent. Any tendency to oversleep was also corrected by a shore fog signal, which blew steadily, even though the night looked moderately clear to us.

Sudden Praise

• • • At 10:15 P. M., Oct. 17, a man walked rapidly into our booth at the National Metal Congress and said: "I just want you to know that I like your magazine real well," and then, as they used to say in the old *Argosy*, "turned sharply on his heel and strode away," before we could thank him or even read the name on his badge. All we caught was "Ohio Brass Co."

"Turned sharply on his heel" is frankly more of a yearning than a fact. We have never seen anyone execute this maneuver, but are always hoping.

Puzzle

Last week's eggs sold for 1c. per dozen, but if you bought an odd egg it cost you 3c.

A man named Pillsbury of the Century Electric Co., St. Louis, dropped in at the booth to say he agrees with us that our method of establishing pars on problems leaves much to be desired. We mentioned the difficulties involved and cited as an example this old one revived recently by A. R. Mattioli:

A man rowing downstream drops his hat into the water. He continues rowing downstream for 15 minutes and then decides to go back for his hat. He recovers the hat one mile downstream from the point he originally dropped it. Neglecting the time required for turning the boat around, how fast is the stream flowing.

Mr. M. set the par at 10 seconds. We said to Mr. P. that we thought it far too low, but he proved it too high by giving the right answer within three seconds, so our courage in establishing pars is rapidly ebbing.

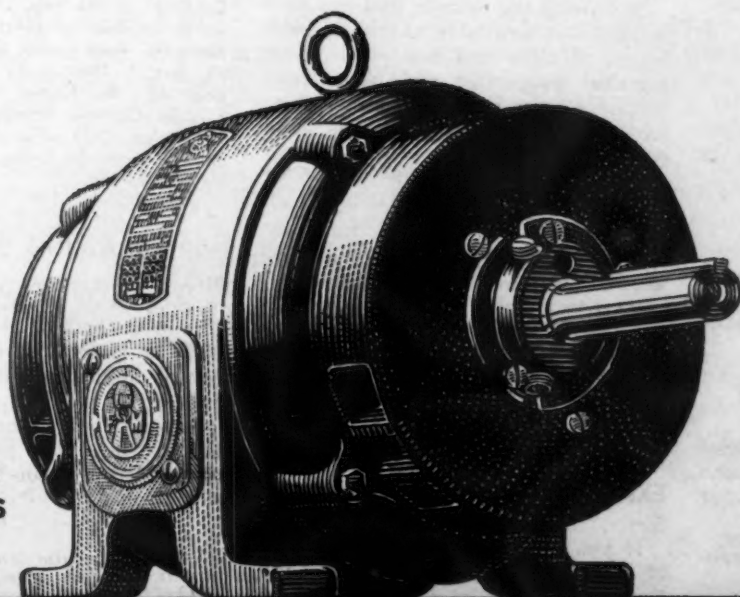
A name worth remembering!



FAIRBANKS-MORSE

After the war, the name Fairbanks-Morse will continue to mark performance-proved products only, as it has for 114 years.

No race to get civilian products onto the market early will tempt us to break this pledge.



Features of the New Fairbanks-Morse General-Purpose Motor

- It is a 40° C. motor.
- It is a protected motor.
- It has an optional conduit box assembly.
- It has cross-flow ventilation.
- It has ball bearings, sealed in and protected.
- It has the exclusive Fairbanks-Morse Copperspun Rotor.

**BUY MORE
WAR BONDS**

DIESEL LOCOMOTIVES • DIESEL ENGINES • GENERATORS • MOTORS • SCALES • PUMPS • STOKERS • RAILROAD AND FARM EQUIPMENT

FAIRBANKS, MORSE & CO., CHICAGO 5, ILLINOIS

Dear Editor:

CENTRIFUGAL CASTINGS

Sir:

Your Oct. 5 issue has a very interesting article by Stanley P. Perry, entitled, "High-Strength Centrifugal Castings." We would very much like to obtain reprints.

A. M. BOUNDS,
Chief Metallurgist

Superior Tube Co.,
Norristown, Pa.

● No reprints were made, but we are sending you a clipping separately.—Ed.

JAP INDUSTRIAL MAP

REQUEST PERMISSION RE-PRINT WITH CREDIT IN THIS WEEK'S ISSUE OUR HOUSE ORGAN REPUBLIC AVIATION NEWS YOUR IRON AGE MAP OF JAPAN'S WAR PLANTS

C. D. JOHNSON

Republic Aviation Corp.,
Evansville, Ind.

Sir:

I am much interested in your map of Japan's war plants. This is highly enlightening and I am sure will be of great interest to employees of the Boeing-Wichita plants which, as you know, have produced the majority of Boeing B-29 Superfortresses now in action in the C-B-I theater. May we reproduce the map in our publication, "Boeing Plane Talk," of course, giving THE IRON AGE credit?

H. W. EBENDORF, Editor,
Boeing Plane Talk

Boeing Airplane Co.,
Wichita, Kansas

● Granted.—Ed.

PRECISION CASTINGS

Sir:

Kindly advise cost of reprints of the article, "Industrial Precision Castings," appearing in your Sept. 7 issue. I shall probably be interested in a quantity of 100. If reprints are not available, how may I obtain permission to make copies giving full credit to you as the original publishers?

ERNEST JACOBY

14 Lowell Road,
Brookline, Mass.

● Owing to paper rationing we are unable to supply reprints. However, you have our permission to have them made. This can be done economically by the photo-offset process.—Ed.

HARDNESS AND YIELD STRESS

Sir:

We would like a clipping of "Relationship of Brinell Hardness and Yield Stress" by T. W. Ruffle, in your Sept. 28 issue.

A. S. JAMESON,
Works Metallurgist

International Harvester Co.,
West Pullman Works,
1015 West 120th Street,
Chicago

Sir:

Please send two copies of "Relation-

ship of Brinell Hardness and Yield Stress."

GEORGE A. PECK,
Engineer in Charge,
Chemical Laboratory

Stromberg-Carlson Co.,
Rochester 3, N. Y.

NE-STANDARD STEEL CHART

Sir:

I believe your NE-Standard steel chart is exactly what I am looking for. I am night foreman on automatic screw machines at a Milwaukee machine shop. Ours is a jobbing shop and can use your NE chart to great advantage. If you have any SAE charts, I would also be glad to have three copies of each. I also want a copy of your Tool Steel Directory.

I. R. CRAGER

3935 A No. 12th St.,
Milwaukee 6, Wis.

● The price of the NE-Standard Steel Chart is 25c. The Tool Steel Directory is \$1.—Ed.

STEEL USES AND TREATMENT

Sir:

Where can I obtain information on various types of steels, both carbon and alloy, regarding their recommended usage and heat treatment?

Lieut. L. I. SIELOFF, USNR

Box 13, Division 5,
Navy No. 115,
c/o F.P.O., New York

● A good source is the SAE Handbook obtainable from the Society of Automotive Engineers, 29 West 39th St., New York. The price to non-members is \$5. The section on steels can be obtained separately for \$2.50.—Ed.

HEAT TREATING DATA

Sir:

We are of the opinion that you have information available on the classification of alloy and tool steels, their physical properties and heat treatment. If you have this material on hand will you kindly send us some copies?

O. G. MASLEN

Müller & Taylor Tool Co.,
5005 Euclid Ave.,
Cleveland

● The "Chart of Comparable Tool Steel Grades" contains elementary information on heat treatment of each type, price 15¢. The "Tool Steel Directory" lists brands alphabetically, specifies type, use and composition, price \$1. The "NE Steel—Standard Steel Chart" shows which steels are comparable and contains some data on heat treatment, price 25¢.—Ed.

EXPORT PACKAGING

Sir:

If you have reprints of your Sept. 21 article, "Packaging for Postwar Export," will you please send me one.

H. L. MAUZY,
Chief Chemist

Reed Roller Bit Co.,
P. O. Box 2631,
Houston, Texas

● No reprints were made but a clipping is being mailed.—Ed.

ULTRASONICS APPLIED TO METAL

Sir:

Your Aug. 24 article, "Metal Coating Facilitated by Ultrasound," opened up quite a field of possibilities to us. We are interested in power requirements, core sizes, details of coils, resistances, thickness of coating, etc.

Any leads you can give us as to more specific information, will be greatly appreciated.

L. M. LEE,
Design Engineer

Fedders Mfg. Co.,
Buffalo 7

● As far as we know, the only work done on ultrasonics as applied to metal coating has been carried out in Europe. We shall have to wait until the war in Europe ends before getting much additional data. A company here in the United States, Sperry Corp., Hoboken, N. J., has developed machines for ultrasonic inspection. If this company has done anything in the way of ultrasonics in metal coating we do not know, but you might inquire.—Ed.

CONTINUOUS CASTING

Sir:

We have read a very interesting article on continuous molding for iron, ferrous and steel in the July *Scientific American*. Being very interested in this matter, we ask where we can get full information. We are also interested in centrifugal casting. Please let us know in which numbers of THE IRON AGE this has been treated. Also please let us know who builds the Junghans-Rossi continuous casting machine.

Simplex,
Maquinas-Agrícolas,
Sociedad De Responsabilidad Ltd.,
Buenos Aires, Argentina

● See the 20-page study "Continuous Casting," in the Feb. 24, 1944 issue. Our latest articles on centrifugal casting appeared in these issues: Oct. 14, 1943, page 98; Dec. 2, 1943, page 54; Mar. 30, 1944, page 42. For further data write to Centrifugal Casting Machine Co., P.O. Box 947, Tulsa, Okla. The Junghans-Rossi machine is made by Irving Rossi, 40 Wall St., New York.—Ed.

WIRE DRAWING SOAP

Sir:

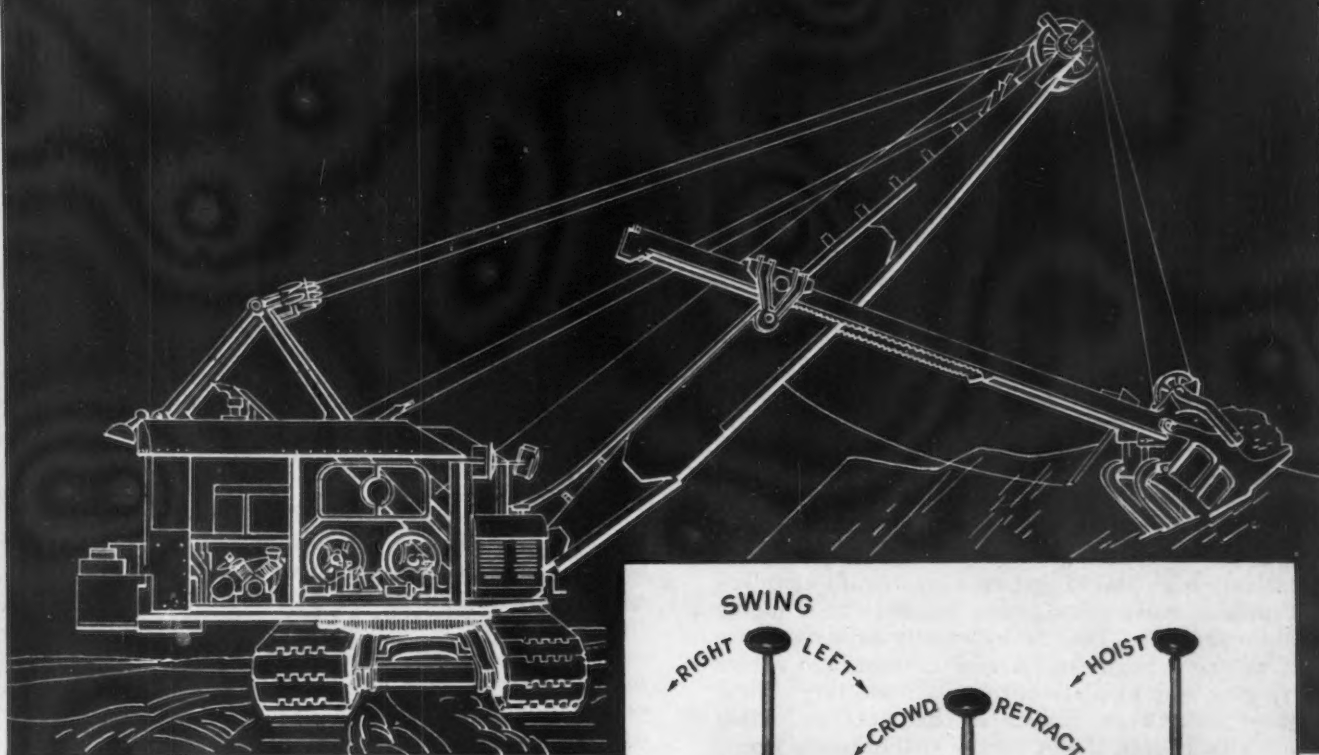
"Soap Aids Wire Drawing" is the title of an article on page 53 of your Sept. 28 issue. We are interested in getting additional information on the product for which F. C. Elder has obtained a patent. Can you give us his address, or if the product is obtainable through other sources, can you tell us where?

F. H. BRYANT,
Secretary

Western Automatic Machine Screw Co.,
Cold Drawn Bar Steel Division,
Elyria, Ohio

● We do not know Mr. Elder's address. However, it probably can be obtained by writing the Patent Office, Washington, D. C. His patent is No. 2,349,708.—Ed.

GIVE W·A·B CONTROLS A PLACE IN YOUR PLANNING

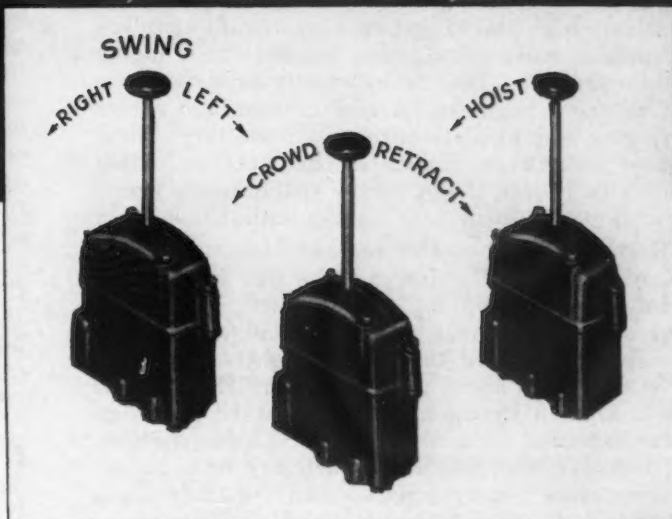


Air substitutes for muscle here—through W·A·B Controls

Some of the post-war improvements and developments that the world is anticipating are already here. W·A·B Controls, for instance.

They concentrate control of a whole series of operations into the movement of a handle. A finger-touch shifts it . . . yet it delivers any desired operating force, from a few ounces to hundreds of pounds. Operator fatigue is reduced, damage to equipment is decreased, efficiency is lifted.

The modern shovel is one of the applications where W·A·B Controls are demonstrating their value and versatility. Pivoting, in-and-out movement of the bucket, and hoisting, are all governed by the small controls pictured. Two opposing motions cannot be set up. There are no heavy levers to muscle to and fro. The complex series of operations that move the earth are cushion-controlled by air.



If you have a control problem in *your* production equipment, or in your products, you'll find it profitable to give W·A·B Controls a place in your planning.

Westinghouse Air Brake Company



INDUSTRIAL DIVISION

General Offices: Wilmerding, Pa.

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remote control systems

75 Years of Pioneering



This Industrial Week . .

- **Steel Order Volume Fluctuates**
- **War Goods Tempo Stronger**
- **Scrap Market Trends Mixed**

WHILE the volume of new steel orders has fluctuated sharply in the past few weeks, the trend is still definitely downward. Decreases, however, are not marked and the decline is leveling off on an orderly basis. Production directives of the War Production Board also tend to be on a downward slant. One mill whose bookings have been consistently ahead of shipments reports that shipments are now about evenly balanced with new orders.

The slow decline in order volume coupled with a relatively high steel ingot rate was again enabling most mills to make satisfactory headway in reducing certain backlogs. This is especially true with respect to sheet business. A few months ago sheets had to give way to plate output, but one large sheet producer this week indicated that its production directive on sheets, if put on the yearly basis, would match its best prewar year's sheet output.

Even though the same pressure for steel deliveries which existed a few months ago is not now present, actual output of steel for war goods continues at a high level. Action abroad on the war fronts had quickened the tempo slightly this week and less is heard about postwar planning. Actually, there is a much stronger reticence toward becoming too far extended on postwar plans. Under the surface, however, the passing of each day finds manufacturers more nearly squared away in their plans even though they are locked in the files. This situation is abetted by contract completion and cutbacks even though dramatic shifts to production of consumers' goods are not apparent.

Indicating the slightly stronger tempo in war goods output is the report that the shell steel program is due for an increase some time before the end of the year. It was recently cut back in order to get it in step with the production of shell making machinery. While requirements by the end of the year are expected to be higher than they are now, they will not hit the peaks originally estimated. The heavy ammunition production program for November and December will comprise around 30 per cent of the 1944 total, with \$52 million scheduled for completion in November and \$62 million in December.

THE fabricated structural steel market gave further evidence this week of breaking away from its tie-up with Maritime construction. Inquiry and award lists have a more normal appearance than for many months. Reports that the Maritime Commission's inventories and those of its contractors contain about 3,000,000 tons of steel, or about five months' supply at the projected shipbuilding pace tally with indications that much smaller new plate requirements will be requested by the Maritime Commission.

Any thought that there may be room in the

structural steel picture for widespread civilian activity is confounded by the Navy's difficulty in placing 50,000 tons of Z-type piling for the Pacific, although it must be conceded that this is a specialty item. A Navy inquiry for 500 two-story buildings involving 26,000 tons of steel gives ample notice that military business will continue an important factor in the structural steel scene.

Other steel market factors include the easing in the tight railroad car situation at one mill and an increased production directive at another, both of which have contributed to a somewhat improved delivery situation in tin plate. On the other hand, can makers have not been taking as much tin plate from mill inventories as was originally expected. This condition may possibly be rectified by the WPB's announcement allowing unlimited tin plate to be used for packing citrus fruits in order to exploit as far as possible fruit grounded by the recent hurricane.

Chicago & Northwestern Railroad is inquiring for 2500 cars involving high strength steel including 1000 70-ton hoppers, 100 50-ton hoppers, 400 50-ton box cars, 750 70-ton gondolas and 250 70-ton ballast cars. The Boston & Maine Railroad has ordered 50 coaches from Pullman Standard Mfg. Co.

ON the foreign trade front, Russia, under diplomatic negotiations, has been granted authority to buy machine tools in this country to the tune of \$10 million monthly for a 12-month period. This business is roughly about one-fourth of current total machine tool shipments. Although orders have not yet been placed, Russia is securing data and bids for a complete steel mill, the ingot capacity of which will be about 8,000,000 tons annually.

THE IRON AGE composite price for heavy melting steel scrap has dropped 8c. this week to \$15.67. However, this has been a period of readjustment with prices in Boston rising, while dropping in several other market districts. In the Chicago and Cleveland areas, increases in certain grades have accompanied decreases in other grades. There is a fluctuating market although volume of business is not high. Nevertheless, it is significant that the buyer's market of the past few months seems to be approaching a critical point.

Steel ingot operations this week declined a full point to 95 per cent of rated capacity. In the following districts output dropped three and a half points: Youngstown, down to 92.5 per cent; West, 91 per cent, and the East, 93.5 per cent. Chicago output gained half a point to 99 per cent while in Cleveland production rose three and a half points to 99.5. Operations in Detroit increased five points to 100.5 per cent. Pittsburgh at 93.5; Philadelphia at 98.5; Buffalo at 102; Wheeling at 91; Birmingham at 94; Cincinnati at 98, and St. Louis at 92.5 continued unchanged.

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Week
October
October

• **MORE ARMOR PLATE**—Possibility of increased armor plate business is indicated by new battle experience at the Siegfried Line. Where previously it was found that 208 tanks were required to keep 100 operative at the front, it is now determined that 300 are needed—indicating probable enlarged ordering.

• **STAINLESS INVESTIGATION**—Grand Jury investigation of the stainless steel industry which was started by the Anti-Trust Division on Aug. 30 will be concluded within the next month, Justice attorneys said on Oct. 20. The Grand Jury is in session in Trenton, N. J. The department has presented the Grand Jury with evidence and testimony of witnesses in an attempt to prove that stainless steel pricing methods have violated the Sherman Anti-Trust Laws.

• **FORD MOTOR PLANNING**—A new, low-priced car, tagged 20 per cent or so below the level to prevail in the Ford-Chevrolet-Plymouth range, will be introduced somewhere around six months from the time the first postwar cars are presented. First postwar Fords will represent changes from 1942 models of the breadth customary in year-to-year design variation. Engineering and research facilities are being coordinated at the laboratories adjoining Ford airport in Dearborn, and a streamlined engineering procedure is being worked out. At least one new assembly plant and one new manufacturing plant will be constructed. The company in all will spend more than \$150,000,000 on reconversion and expansion, the bulk of it in plant enlargements, machine tools and other facilities.

• **SCRAP INVENTORY UP**—Stocks of iron and steel scrap at plants of consumers, suppliers, and producers at the end of August, 1944, approximated 5,975,000 gross tons, an increase of 1 per cent over the 5,909,000 tons reported on July 31, 1944, according to a statement released by the Bureau of Mines, United States Department of the Interior. Consumers stocks on Aug. 31 were 4,861,000 tons, compared with 4,770,000 tons at the end of July, while the combined stocks of suppliers and producers were 1,114,000 tons and 1,139,000 tons on the same dates. An increase of 70,000 tons in consumers' stocks of home scrap was the major factor in the gain in total inventories. This gain was partially offset by a decrease of 25,000 tons in suppliers and producers stocks in the overall canvass. Although con-

sumers' stocks of purchased scrap increased 21,000 tons, there seems to be no reason for optimism regarding the supply of this material, since dealers' stocks declined over 25,000 tons, despite an increase of 21,000 tons in the amount of scrap salvaged by suppliers. The decline in scrap salvage over the past 16 months indicates that this source of material is rapidly being depleted, and that suppliers are more dependent on production scrap to fulfill their commitments.

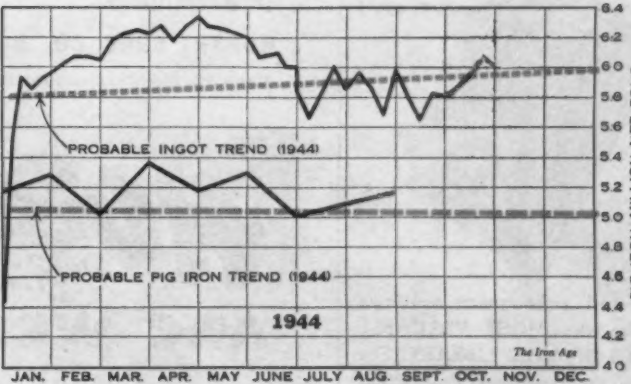
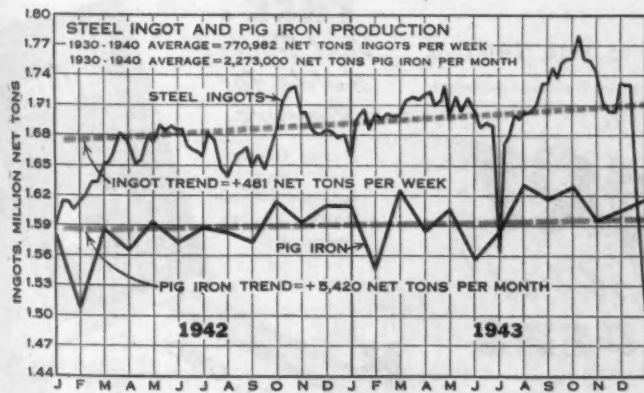
• **POSTWAR STEEL MANPOWER**—Despite an expected lower operating rate in the postwar period, WPB manpower officials are predicting that 10 per cent more steel workers will be employed then, than are working in the industry now. This prediction is based in part upon the peace-time necessity for more workers in finishing operations which have been abandoned in war-time and in part upon a shortened workweek.

• **WEST COAST SURPLUSES**—Steel warehouse leaders, along with other principal heavy materials distributors, both in southern California and around San Francisco Bay, have held meetings and conferences these past few weeks to consider a proposed super-plan for handling all shipyard and aircraft surplus materials. Through a joint syndicate arrangement in which the government and private distribution would each participate, the plan proposes to spread the absorption and conversion of surplus stocks and materials over a 10 to 20 year period.

• **TIN PLATE AVAILABLE**—Open capacity for December scheduling will be available in the tin plate industry, members of the Tin Plate Industry Advisory Committee told the WPB at a recent meeting. They pointed out that facilities and manpower have been ample to roll 750,000 tons allotted during the fourth quarter and also will be sufficient if allotments in the first quarter of 1945 are increased. WPB officials said that after all fourth quarter allocations are made, survey will be taken to see if an additional allotment can be authorized in December. To conserve manpower, committee members recommended the use of ¼ lb. electrolytic tin in place of special coated terns for oil cans.

• **IRON ORE**—The total 1944 shipments of Lake iron ore up to Oct. 1 amounted to 65,903,184 gross tons, an increase of 800,889 tons over the corresponding period of 1943, according to ODT.

The Iron Age



Steel Ingot Production by Districts and Per Cent of Capacity

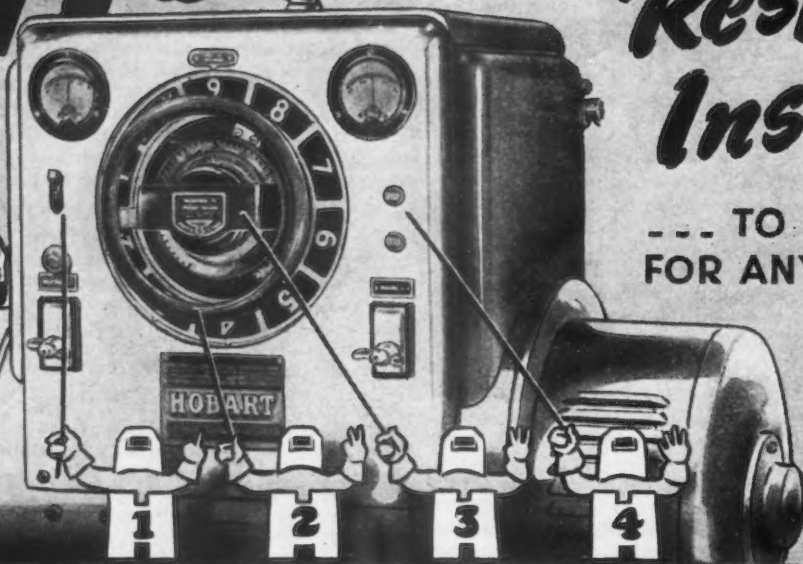
Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
October 17.....	93.5	98.5	96.0	98.5	96.0	102.0	91.0	94.0	95.5	94.5	98.0	92.5	97.0	96.0
October 24.....	93.5	99.0	92.5	98.5	99.5	102.0	91.0	94.0	100.5	91.0	98.0	92.5	93.5	95.0



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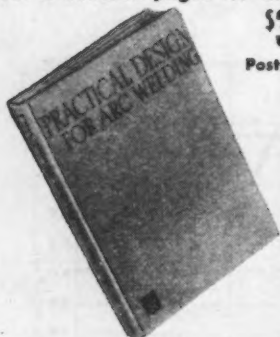
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"PRACTICALLY AUTOMATIC," is what welders everywhere are saying about the Hobart Multi-Range Dual Control Arc Welder. Of course they know an automatic arc welding generator is out of the question for the present. However, they find Hobart the nearest thing to automatic on the market today. Figures above indicate the features that are responsible for the fine, close control you get with a Hobart. (1) Convenient and simple switch for changing polarity to suit the different types of electrodes. (2) Outer wheel and dial for selecting the desired welding range. It provides 10 steps which, with the 100 steps in the inner wheel, make possible a wide range of 1,000 volt-ampere combinations. (3) Inner wheel and dial for adjustment of heat and of relation between voltage and current. Removable for Remote Control. (4) Starting switch located inside turret top. Start, stop and reset buttons on outside of cabinet. Switch fully protected against overload, under-voltage and conditions of phase unbalance in power supply.

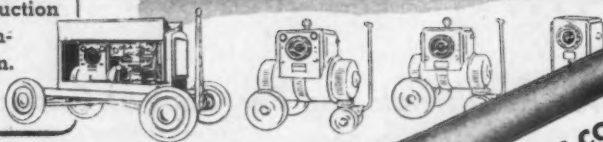
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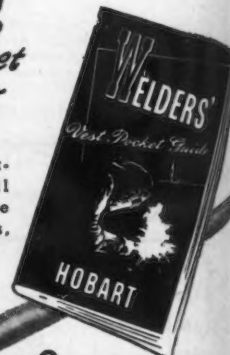
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HOBART BROTHERS CO., BOX 1A 1034, TROY, OHIO

**BUY MORE BONDS
for VICTORY**

Critical Manpower Problem In Buffalo Over; Reconversion Starts

Buffalo

••• First indications of a breakup in the long critical manpower picture in this area came recently when the WPB announced locally that authorizations for 13 firms to manufacture 15 different items for civilian consumption had been approved for immediate production. This action, following repeated warnings voiced here that no civilian production would be permitted locally until the manpower situation had eased, probably presages the removal of the No. 1 critical labor classification.

This action seems indicated despite the fact that government officials locally assert that employees in plants authorized to begin reconversion are "incapable of performing work in war plants." Among the items approved for production are vacuum fans for automotive equipment, commercial cooking equipment, baby seats for autos, inner spring mattresses, cast manhole covers and frames, cutlery, and farm machinery.

This is the first break in an area that has been almost completely devoted to war production for the past three years. Through subcontracting, most of Buffalo's greatly diversified industries have been tied directly into the war program. In contrast to industrial centers such as Detroit, famed for the existence of huge industrial units of one particular type, Buffalo has long been known as a center of many comparatively small and diverse manufacturing units. Heavy industry, transportation, automotive assembly and parts work, foundry and aircraft have all been well represented. This diversification has historically prevented the peaks of prosperity and depression from being too pronounced.

During the period of all out war production the national prominence of aircraft manufacture has reflected in the Buffalo picture, with Curtiss-Wright and Bell hitting a payroll peak, now past, of about 85,000 workers in four major plants in the area. Chevrolet conducted a huge expansion program to set up a Pratt and Whitney aircraft engine program. These plants will tend to be the most serious problem in Buffalo's reconversion, and depending on the future of the aircraft business nationally, may tend to

change somewhat the pattern of diversification in Buffalo.

Although the problems in general confronting the over-expanded plane firms are well known, there are certain aspects of the local situation more favorable for postwar survival than for some of the West Coast plants. Curtiss has long been in the commercial field, and was in the fortunate position of producing one of the best of a long line of Curtiss planes just prior to the beginning of the war. Designed to be a luxury transport, it was immediately converted to a cargo plane, and several airlines now have experience operating this plane under the Air Transport Command. Due to millions of miles' experience in all-weather operation, the inevitable bugs of a new type airplane have been worked out.

Curtiss has already announced plans for a modification of the craft now going into production, and as soon as war orders are eased, a backlog of civilian orders is ready to take up the slack. (See THE IRON AGE, Oct. 12, p. 119.)

In the other local aircraft firm, Bell, the picture is not so clear. Long possession of a reputation for engineering innovation, Bell has already stated definitely that it will be in the helicop-

ter field after the war, although the company is taking a conservative viewpoint on the future of the machine. The feeling is that Arthur M. Young, Bell's expert in the field, is as advanced in the development line as anyone in the field. The company's early start in the jet plane program should mean something in the future, but until the commercial development in this line appears, the field is wide open, and no one firm's position is assured.

Cutbacks have already reduced Bell's employment level from about 35,000 to less than 25,000, and they have been easily absorbed. Hiring at Curtiss has just been stopped, which through normal quits will make their payroll drop progressively.

Chevrolet's converted engine plant is scheduled for return to auto engine production, although assembly operations will probably not be resumed. While the Ford Motor Co. did not attempt war production in this area, Henry Ford II has already announced his intentions of resuming and expanding assembly operations here as soon as possible. Other local firms serving the auto industry with components and accessories are in a strong position assuming a demand for the postwar auto. They have tended largely to retain their regular plant equipment, so a comparatively short job of die changing, et cetera, will complete their reconversion.

EXTRA DETAIL—A Marine Master Tech. Sgt., somewhere in the Marshalls Islands, is about to do a grease job on the all-purpose truck, the Swampmobile. The cement to build the grease pit was left by Japs who were driven from the island.



Postwar Period to Take More Steel Workers Despite Lower Output

Washington

• • • Despite an expected lower operating rate in the postwar period, WPB manpower officials are predicting that 10 per cent more steel workers will be employed then than are working in the industry now.

This prediction is based in part upon the peacetime necessity for more workers in finishing operations which have been abandoned in wartime and in part upon a shortened workweek.

The American Iron and Steel Institute has recently reported that 43,000 fewer workers were employed in 126 steelmaking companies in June, 1944, than in October, 1942. The length of the work week was 47.2 hr. in June as compared to 39.8 hr. in October.

While the foregoing figures are considered inconclusive to measure increased employment because of added finishing operations, they definitely show that a longer work week diminishes the number of employees required for practically the same operations.

Meanwhile, WPB has under consideration a manpower plan to be used in the reconversion period. The plan calls for the assignment of manpower priorities to industries accord-

ing to their essentiality to the civilian economy.

Curtiss Modifies C-46 to Prepare It For Airliner Uses

St. Louis

• • • Presumably to better adapt it for commercial use as soon as possible, Curtiss-Wright has announced here the modification of the familiar C-46, with new design features to go into assembly lines already established here and in Buffalo and Louisville. Included are new pilot's windshield contours for improved vision.

The company still is going no further than to say that the CW-20, projected commercial version of the C-46 Army Transport, will be that company's bid for the immediate postwar future. Guy W. Vaughan, president of the company, does add that it will be "the first of a line of transport and cargo planes," without giving any hint of what they may be.

Observers wonder if the statement covers a projected use of gas turbines which Vaughan has already announced that his engine division, Wright Aero., is developing. This

could be no more than long range planning at this stage of heavy wartime production, but many engineers feel that the future of the gas turbine will be in the long range transport field, where economical flying will be done at extremes of speed and altitude.

Such a craft would seem desirable for trans-oceanic flights where the distance involved would render high fuel consumption rates in climbing to cruising altitude economical. It would probably be flying at about 40 to 50 thousand feet, at speeds not accurately predictable. In the foreseeable future this would be for the traffic willing to pay high premium of maximum speeds.

The commercial modification of today's wartime cargo ship will include as many provisions as possible to provide for the comfort and convenience of passengers. It includes many features suggested by airline operators, who have been called in to confer on arrangement and facilities.

Among the basic design changes of the Curtiss Commando, resulting from operational experience under the entire range of weather conditions, are all-welded, easily-removable fuel tanks; major redesign of the nose; more powerful engines; improved flight control; greater speed, and increased gross weight and payload.

The silhouette is changed with a recessed nose design providing greater visibility and improved de-icing for bad weather operation. Deep side-view windows increase the pilot's range of vision in landing operations. Improved ground visibility in wet-weather flying is provided. Double-pane safety glass equipped with de-fogging nozzles insures clear vision in cold flying weather.

Recommendations to airplane builders from the Civil Aeronautics Administration for a "bird-proof" windshield have been incorporated into the Commando.

Control of the airplane in flight is improved through substituting—for hydraulic power boost—of aerodynamic balance and spring tabs on ailerons, rudder and elevators.

Lake Ore Shipments Increase in October

Washington

• • • The total 1944 shipments of lake iron ore up to Oct. 1 amounted to 65,903,184 gross tons, an increase of 800,889 tons over the corresponding period of 1943, according to ODT.

AMPHIBIOUS LANDING—Americans of the 81st Division go ashore from their amphibian tractors on the beach at Mogmog during the Sept. 20 invasion of the Ulithi group in the Carolines, between Palau and Guam. Natives watch from beside their thatched hut.



Russia Settles Petsamo Mines with Canada for 20 Million

Ottawa

• • • The Russian Government will pay \$20,000,000 in United States currency (equivalent to \$22,000,000 Canadian at current exchange rates) to the Canadian Government as full and final compensation for taking over the Petsamo nickel mines which Finland had leased to the International Nickel Company of Canada and its subsidiary the Mond Nickel Company, Prime Minister Mackenzie King announced. Payments will be spread over six years.

The announcement, similar to ones made in London and Moscow, said that a protocol had been signed in Moscow concerning the compensation to be paid by the Soviet Government for transfer of the mines to Soviet ownership.

The mines, owned by the Finnish State and leased to the International Nickel Company and the Mond Nickel Company of the United Kingdom, were in the Petsamo district that was ceded to the Soviet under the armistice agreement of Sept. 19, 1944.

Text of the protocol, signed by Canadian, United Kingdom and Russian representatives, reads:

"On the occasion of the signing of the armistice agreement with the Government of Finland, the Government of the United Kingdom of Great Britain and Northern Ireland, the Government of Canada and the Government of the U.S.S.R. are agreed that:

"In connection with the return by Finland to the Soviet Union of the former Soviet territory of the Oblast of Petsamo and the consequent transfer of ownership to the Soviet Government of the nickel mines (including all property and installations appertaining thereto) operated in the said territory for the benefit of the Mond Nickel Company and the International Nickel Company of Canada, the Soviet Government will pay to the Government of Canada during the course of six years from the date of signing of the present protocol, in equal instalments, the sum of \$20,000,000 United States dollars as full and final compensation to the above-mentioned companies. For the purpose of this payment the United States dollar will be reckoned at the value of \$35 to one ounce of gold."

Robert C. Stanley, chairman and

president of the International Nickel Company of Canada, said tonight that the protocol concerning the transfer of ownership of the Petsamo nickel mines to the U.S.S.R. was signed at Moscow by the Canadian and British Ambassadors and a representative of the Soviet Government.

He explained that the Canadian Government was to receive the payment of \$22,000,000 compensation for the mines, which would be passed on to the company.

West Coast Considers Proposal for Handling All Surplus Materials

San Francisco

• • • Steel warehouse leaders, along with other principal heavy materials distributors, both in southern California and around San Francisco Bay, have held meetings and conferences these past few weeks to consider a proposed super-plan for handling all shipyard and aircraft surplus materials through a joint syndicate arrangement in which the government and private distribution would each participate. The plan proposes to spread the absorption and conversion

of surplus stocks and materials over a 10 to 20-year period.

A private corporation somewhat like Metals Reserve Corp. would be formed, principally financed by government funds so far as stocks are concerned, but with additional operating capital privately subscribed. Government owned materials and facilities would be inventoried and centrally warehoused. For contractor-owned materials and facilities a token down payment would be made on a practical appraised settlement value, balance to be payable on final disposition. At each major distributing point a central operating warehouse organization would be formed to take over the management, holding and gradual disposal of these stocks. Private commercial distributors would agree to purchase merchantable materials in regular increments over the years, to work in with their stocks and with materials acquired from ordinary sources of supply.

It is proposed that this general method would provide for joint handling by public representatives and private distributors, controlled by private industry and management and for orderly disposal of merchantable stocks and gradual conversion, scrapping or most advantageous disposal of special items, without demoralizing the postwar market and to return maximum credit to the government consistent with the restoration of normal distribution and business activity.

NEW RAF FIGHTER

—The Royal Air Force's newest fighter plane, the Hawker Tempest, has a De Havilland variable pitch four-bladed propeller and is powered by a supercharged 2200-hp. engine. This plane has accounted for 600 German robot bombs, which its pilots knocked down in flight.



Building Industry to Have Capacity to Erect New Homes After V-E Day

New York

••• The construction industry will have the capacity to produce about 350,000 homes during the first 12 months after the defeat of Germany, according to the best estimates and opinion of government officials and industrialists. Independent inquiries and investigations by F. W. Dodge Corp. bear out the accuracy of these expectations on the basis of all available information.

Builders the country over are not so much concerned with the market for new homes as they are with their capacity to produce in the light of expected stringencies in equipment and materials, at least during the first three months after V-E Day. Many have been engaged in supplying housing needs in critical areas as a part of the war effort, and hence are ready organization-wise to proceed with orders on hand, and to build houses for sale or rent.

There are many factors which have an important bearing on the capacity of the industry to produce new homes. Among these are the availability of labor, building materials and equipment, and the attitude of such government agencies as the War Pro-

duction Board, the National Housing Agency, and the War Manpower Commission toward a home-building program.

As far as is known, government agencies all recognize that the success of reconversion depends in great measure on the construction industry. They have considered a schedule of production of scarce items presenting the toughest conversion or supply problems. The idea is to get a balance of building equipment on the market three months after V-E Day to permit orderly building procedure.

Monthly Survey Shows Employment Wage Drop For Industrial Workers

New York

••• Average hourly earnings of all wage earners in manufacturing industry declined 0.2 per cent in August to stand at \$1.070, according to the regular monthly survey of 25 manufacturing industries by the National Industrial Conference Board.

This figure, which includes overtime and other monetary compensations, marks the first decline in nearly five years—since January, 1940. At \$1.070 per hr., hourly earnings were 4.9 per cent above the August, 1943,

level, 41.0 per cent above that of January, 1941 (the Little Steel formula base), 48.6 per cent above that of August, 1939, and 81.4 per cent higher than the average in 1929.

Weekly earnings averaged \$48.89, an increase of 0.1 per cent over July. They were still 5.7 per cent higher than in August, 1943, and 59.7 per cent above January, 1941.

"Real" weekly earnings, which measure the quantities of goods and services that can be purchased with dollar weekly income, rose slightly, by 0.1 per cent. They were 3.2 per cent above a year earlier, and 30.9 per cent above January, 1941.

Hours worked per week rose 0.1 hr. in August, or 0.2 per cent. The 45.5 hr. averaged in August were 0.4 hr. or 0.9 per cent more than were worked in August, 1943, and 5.3 hr., or 13.2 per cent, more than in the January, 1941, week.

Employment in the 25 manufacturing industries fell off 0.6 per cent in August. Since August, 1943, there has been a drop of 7.7 per cent, but the total exceeded the January, 1941, level by 25.8 per cent.

Man hours in August were 0.4 per cent lower than in July, and 6.9 per cent below August, 1943.

Payrolls declined 0.6 per cent from July. They were 2.5 per cent less than in August, 1943, but 101.0 per cent greater than in January, 1941.

OPA'S Pricing Problems

THE SIZE OF OUR RECONVERSION PRICE PROBLEM

PRODUCTS NOW UNDER PRICE CONTROL

TOTAL CONSUMERS' EXPENDITURES
IN 1943 CAME TO—\$92 BILLION
OF THIS, PRICE CONTROL REACHED—\$78 BILLION
OR 85 PERCENT

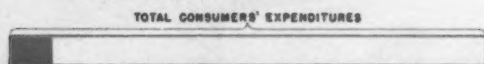
MAJOR GROUPS UNDER CONTROL WERE:

FOOD	-----	\$33 BILLION
CLOTHING	-----	13 BILLION
RENT	-----	7 BILLION
FURNITURE, ETC.	-----	3 BILLION
HOUSEHOLD FUELS	-----	3 BILLION
SERVICES	-----	3 BILLION



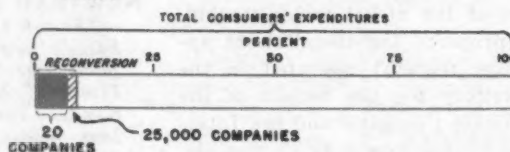
UNDER PRICE CONTROL
CONTROL OF RECONVERSION PRICES IS A
MINOR ITEM IN COMPARISON

IN 1941, WHEN THESE ITEMS (CONSUMERS'
METAL-USING DURABLES) WERE LAST IN
PRODUCTION, THEY AMOUNTED TO \$6½ BILLION
OR 8½ PERCENT OF CONSUMERS'
EXPENDITURES

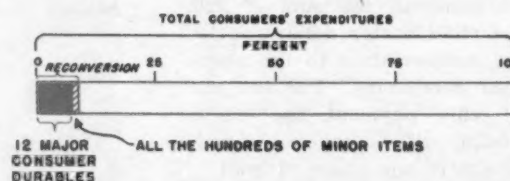


VOLUME OF RECONVERSION GOODS

FURTHERMORE, ABOUT 80 PERCENT OF THIS
VOLUME WAS IN 1941 PRODUCED BY A SCORE OF COM-
PANIES



OR, ON A PRODUCT BASIS, A DOZEN ITEMS—
PASSENGER CARS, REFRIGERATORS, RADIOS, ETC.—
CONSTITUTED 85% OF THE TOTAL



Bendix Survey Shows Schools Ready to Use Aircraft Surpluses

Chicago

• • • Results of a nation-wide survey of higher educational institutions show that 307, out of 455 American colleges and universities which replied, are making plans for teaching post-war courses in aviation, Ernest R. Breech, president of Bendix Aviation Corp., disclosed here.

Revealing detailed results of the survey, Breech declared these 307 schools and others who expressed definite interest said they will want and need substantial quantities of usable government-owned aircraft equipment, which can be made available to them under the Surplus Disposal law signed by the President October 3.

Responses to the survey showed that 237 colleges now teach some aspects of aviation, that 212 of these schools are definitely planning to continue or expand their curricula after the war and that 95 additional schools are planning to establish post-war courses, Breech declared.

The Bendix president, who headed the Aeronautical Chamber of Commerce committee on surplus aircraft disposal, spoke on "Turning Aircraft Surpluses Into Educational Assets," at a joint educators' meeting held here.

In replies to his company's survey, Breech stated, 76 institutions said they now have the necessary facilities for a permanent program of aviation education and 160 institutions said they have fairly adequate or at least "limited" facilities — but will need modern equipment and other teaching aids developed as part of the immense wartime expansion of aviation.

Household Nutrients Are Now Employed In Iron and Steel Making

• • • Such familiar household stand-bys as salt, molasses, corn and bran are useful in the iron and steel industry for other than dietary reasons, according to the American Iron & Steel Institute. They are employed in large quantities in steel making, and even sugar and soap can be used as an aid to production.

Salt is employed generously in the rolling of steel plates to help break the scale from the surface of the slab, and from the resulting plate. Just before the slab enters the rolls, the salt is thrown onto it with scoops. The salt is carried under the rolls and brought into close contact with the hot metal which helps remove the scale. For the same purpose salt sometimes is used in the making of pipe.

Salt has also been used in open hearth ladles as a fluxing agent to assist in rendering impurities more fusible. It has been used in mixer spouts to help prevent accumulations of iron.

In making castings, corn products and molasses are among the substances utilized to bind the sand used in foundry molds. At the start of this year it was estimated that around 100,000,000 lbs. of corn would be required for metallurgical applications alone during 1944.

There are additional uses for corn in the steel industry. Some producers have utilized corn lacquer in the processing of tin plate.

Bran middlings are employed by the steel industry in the manufacture of tin plate as an agent to help remove oil from the product.

Soap aids the steel industry during the making of wire, which is brought down to the desired size through dies. Soap helps abate the tremendous friction created in the drawing process, and can also be employed to coat cartridge blanks before they are drawn into shape.

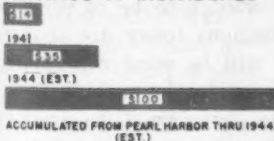
Pure corn sugar, blown onto the inner surface of ingot molds can be used to help prevent splashed metal from solidifying on the walls of the mold. It is applied by a process patented several years ago.

in Reconversion Periods

TWIN DANGERS TO OUR NATIONAL ECONOMY IN 1945

THREAT OF INFLATION

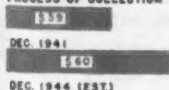
SAVINGS OF INDIVIDUALS



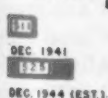
ACCUMULATED FROM PEARL HARBOR THRU 1944 (EST.)

DEMAND DEPOSITS

END OF MONTH
INCLUDES ALL DEPOSITS EXCEPT INTERBANK AND U.S. GOVERNMENT, LESS CASH ITEMS IN PROCESS OF COLLECTION



MONEY IN CIRCULATION



UNSATISFIED DEMAND

BIG, BUT HOW BIG?

DURING 1942, 1943, AND 1944 THESE CONSUMERS' DURABLES HAVE BEEN OUT OF PRODUCTION, EITHER COMPLETELY OR IN MAJOR PART. IF DURING THESE 3 YEARS THE 1941 RATE OF PRODUCTION HAD CONTINUED HERE IS THE NUMBER OF THESE GOODS THAT WOULD HAVE BEEN PUT ON THE MARKET FOR AMERICAN CONSUMERS:

10,980,000	AUTOMOBILES
10,500,000	REFRIGERATORS
6,042,000	WASHING MACHINES
6,351,000	VACUUM CLEANERS
16,755,000	ELECTRIC IRONS
7,923,000	TOASTERS
41,100,000	RADIOS
82,380,000	CLOCKS AND WATCHES
10,400,000	FURNACES AND HEATERS
14,010,000	STOVES AND RANGES

THREAT OF DEFLATION

AT PRESENT, CIVILIAN SALARIES AND WAGES (OFF THE FARM) ARE RUNNING ABOUT \$94 BILLION A YEAR



DURING RECONVERSION, HOURS WILL BE REDUCED AN ESTIMATED 10 PERCENT. THE EFFECT ON WAGES INCLUDING OVERTIME WILL REDUCE THIS TOTAL BY \$12 BILLION



RECONVERSION WILL ENTAIL A CUT OF 10 PERCENT (5 MILLION) IN EMPLOYMENT. THIS WILL REDUCE SALARIES AND WAGES BY A FURTHER \$8 BILLION



OPERATING MORE SLOWLY, THERE WILL BE A REVERSAL OF THE UPGRADING PROCESS WHICH OCCURRED DURING THE WAR, AND MEN WILL LEAVE HIGH PAYING WAR JOBS FOR LOWER-PAYING JOBS IN PEACE-TIME PRODUCTION. THIS WILL REDUCE SALARIES AND WAGES BY NO LESS THAN \$10 BILLION.



ALTOGETHER, WE FACE A CUT OF \$30 BILLION IN SALARIES AND WAGES AFTER V-E DAY.

**THIS MEANS SHRINKING MARKETS
—A SERIOUS DEFLATIONARY FACTOR**

Railroads Have Huge Costs Deferred for Maintenance Work Undone

Washington

• • • At the opening of the railroad rate increase case on Oct. 23, Dr. Julius H. Parmelee, director of the Bureau of Railway Economics of The Association of American Railroads told the Interstate Commerce Commission that because of the wear and tear of heavy war traffic and the shortage of materials and labor a considerable amount of maintenance and improvement work has been necessarily postponed. He said that the railroads will need to make substantial expenditures to rehabilitate their properties after the war.

"It is difficult to apply exact statistical measures to the amount of deferred maintenance," said Dr. Parmelee, "but for the period from 1934 to 1943, maintenance changes were about 20 per cent under those for the period 1924-1933, despite increases in traffic, in maintenance wage rates and in prices of maintenance materials."

The railroads have asked the ICC to allow freight rate increases, authorized in 1942 but suspended since May, 1943, to become effective Jan. 1.

Dr. Parmelee declared that while

railroad traffic and operating revenues this year are expected to reach their final peak, net earnings went over the hump two years ago and are on the decline due to the increased operating costs largely brought about by the fact that since 1940 railroad labor unit costs have increased approximately 27 per cent and the prices of railroad materials and supplies have increased approximately 29 per cent. Due to these increases in cost of labor and material, Dr. Parmelee pointed out, operating costs have increased more than \$1,100,000,000 annually compared with 1940. Meanwhile, he added, the average charge for moving freight has actually declined.

"Restoration of the suspended increases, resulting in an average increase in freight revenues of about 4.7 per cent," Dr. Parmelee said, "will be a moderate contribution toward offsetting the effect of higher wages and prices and will aid the railroads in the reconversion and postwar period in meeting their problems of improvement, maintenance, employment and adequate service."

Dr. Parmelee said that over the first five postwar years the railroads would need 350,000 new freight cars and 6350 new locomotives. The annual outlay for this equipment, it was stated, would be \$300,000,000 or more. Pointing out that it is much more difficult to indicate prospective capital expenditures for passenger train cars, Dr. Parmelee said that \$50,000,000 a year over a five-year period would seem to be a conservative estimate. The addition of another \$350,000,000 a year for improvements to roadways and structures, he said, would make capital improvement a total \$700,000,000 annually.

Jet Craft Future Depending on New Power Combinations

Buffalo

• • • Pure jet type aircraft, today being introduced into combat action by both the Axis and the Allies, will probably be valueless in terms of postwar commercial uses, according to Frank H. Kelley, assistant to the president of Bell Aircraft Corporation. His statement was made here recently on the occasion of a meeting of the Buffalo Engineers Society held in the Hotel Statler.

According to Kelley, who was one of the first test pilots to fly the P-59A Airacomet, Bell's jet-propelled fighter, further developments in the gas turbine field will bring this type of aircraft into competition with commercial craft of conventional type, probably to revolutionize the field; however, they are not likely in light of present knowledge to be of pure jet type. Indications today are that instead they will be some combination of propeller and/or jet turbine.

The meeting was devoted entirely to the discussion of various forms of turbine propulsion, with J. K. Salisbury, from the Turbine Engineering Division of General Electric, one of the principal speakers. General Electric was the first firm announced to be building thermal jet units in this country of the type being used in the Bell plane.

According to most recent announcements, the P-59 is being used "for training purposes" by the Allies, but a British model, being built by Gloucester Aircraft is now in operational use, against robot bombs.



DUMMY AIR-
P L A N E
PLANT: One
of the industries
lost to the Ger-
mans when Al-
lied troops took
Dijon, France,
was this com-
plete plant for
the manufacture
of dummy air-
planes. The
Nazis used these
dummies to at-
tract Allied
bombs and pre-
vent their use
on real targets.

WPB Struggling to Reach Decision on Controls Relaxation

Washington

• • • Because the WPB Statistical Division has reported that the steel business may be much better than has been expected in the six months after X-Day than the industry has reported, weight has been given to arguments in and out of WPB that controls not be abandoned completely after S-Day.

The Statistical Division, in a report based upon estimates made by claimant agencies, said that while production may slip from about 16,000,000 to 10,000,000 or 11,000,000 tons of finished steel in the first quarter after X-Day, the second quarter will see demand up around 14,000,000 tons. This is within about 2,000,000 tons of quarterly capacity.

The report has furnished ammunition to those who are battling WPB Chairman J. A. Krug's plan for rather complete relaxation of WPB controls after X-Day.

The WPB program bureau headed by Vice-Chairman Sam Anderson is insisting upon a band of junior priorities in addition to the AA ratings it is now planned that the military shall use after X-day.

OPA Administrator Chester Bowles has opposed any wholesale lifting of WPB controls because the sudden scramble in the markets for materials and components will result in price controls being sabotaged. Mr. Bowles fears that goods will be made and the cream skimmed off the market by manufacturers who are able to get materials and components ahead of smaller competitors.

Representations have been received from the combined raw materials board and the combined production and resources boards which say that the junking of orders may imperil existing United States export commitments.

Finally, Senator Tom Stewart, Democrat of Tennessee, has raised the question of what is to happen to the small producer. If it is understood that the Smaller War Plants Corp. will propose machinery to aid small business if it turns out that the Statistical Division report is correct.

Meanwhile, the fight continues unabated, and it has been described as the worst battle WPB has ever gotten itself into. WPB Chairman Krug has industry operations Vice-Chairman H. G. Batcheller on his side, as well as

Labor Production Vice-Chairman Joseph Keenan.

OCR Director William Y. Elliott is reported to be on the side of Mr. Anderson. There are rumors which have not been confirmed that OCR is about to be abolished.

Mr. Krug asserts that the Steel Industry Advisory Committee has informed him that there will be enough steel for every manufacturer after Germany falls. Steel industry sources have gloomily said that the production rate may sag as low as 40 per cent of ingot capacity and then within a six months' period would bounce back to 75 per cent of capacity, perhaps.

The statistical division report is predicated upon a belief that military demand for steel will sink as low as 3,000,000 tons of finished steel a quar-

ter. The latter figure is material classified strictly for military end product and does not contain material for components or "B" products.

The Statistical Division says that conversations with steel consumers seems to justify the high estimates of steel demand after the German war.

Mr. Krug and his proponents are of the belief that the program bureau's proposals that union ratings be granted would make WPB discriminate between industries and companies. This would lead to charges of bungling, favoritism and bureaucracy, the chairman's contingent believes.

On the other hand, Mr. Anderson, who is said to agree with the Military viewpoint, says that plants can be assisted in reconverting better if preference ratings are set up. Mr. Krug says that it will turn out like the old priority system did, if various grades of priorities are not given and various grades of rating lead to charges of favoritism, bungling and bureaucracy.

Newest Type Bazooka Designed and Built By General Electric Co.

Bridgeport, Conn.

• • • A new type of bazooka designated "Miz" has been designed by General Electric for the field artillery.

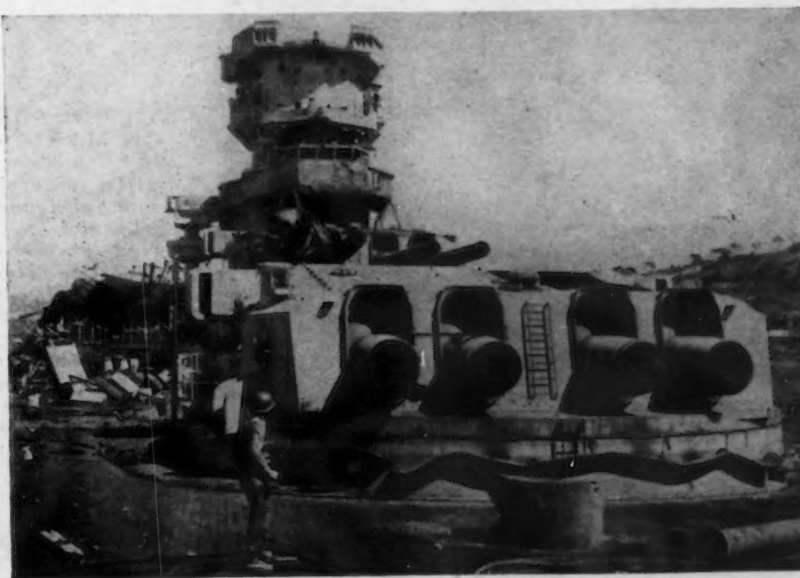
The gun is officially known as "Rocket Launcher M12."

The M12 weighs 35 lb. when loaded,

and may be carried and fired by one man. The 45-in. projectile for the gun is 3 ft. long and packs a terrific wallop against enemy gun emplacements.

When the tripod and tube are in position a short distance from an enemy strong point, the artilleryman strings a wire from the gun to its "trigger." The firing of the gun may be done by the same set-up man from behind his own lines.

SCUTTLED STRASBOURG: An American soldier looks over the scuttled French battleship *Strasbourg* in the Harbor of Toulon, France. This view from the bow shows the four lower turret guns, the ends of which have been cut off, and four guns above.



20 Per Cent Rise In Jobs Is Goal Of American Can Co.

New York

• • • A postwar employment level approximately 20 per cent above normal prewar payrolls in the 67 factories of the American Can Company was predicted recently by D. W. Figgis, president.

The statement followed a meeting of executives from all sections of the country to discuss postwar plans, placement of returning veterans and other employment and personnel relations activities.

Mr. Figgis said the employment increase is expected to result from a greater demand for metal containers for products packaged in cans before the war as well as new products and from new factory space which the company will have after the war.

He cited as a basis for his forecast, survey and studies of the postwar container market. These surveys, he stated, indicate rapid return to metal cans of many products now packed in substitute containers and expanded markets for a number of items, production of which was curtailed by wartime restrictions on materials and manufacturing equipment. Among these he listed vacuum packed coffee, milk in fibre containers and canned beer. He also predicted greater volume of canned meats in America and elsewhere.

As much of the company's war output has been produced on regular can manufacturing lines and in the company's machine shops, mechanical con-

version from government to civilian production will present no appreciable problems, Mr. Figgis said. Special facilities, he said, were provided for manufacture of items foreign to the company's usual lines, such as torpedoes, which are being produced in plants operated for the government.

Spot Authorization Plan to Be Modified

Washington

• • • The spot authorization plan is headed for modification if the war continues through the winter and WPB has approved applications amounting to more than \$152,000,000 it was announced on Oct. 23.

Metal working plants employing less than 50 workers on the West Coast and 100 men elsewhere will be freed from all production controls. In conjunction with this simplification, WPB has obtained the approval of all agencies except the War Department to deprive Area Production Urgency Committees of the authority to turn down spot authorization applications on manpower grounds. This would rule out Army and Navy intervention in the APUC and would leave to WMC the duty of passing upon manpower questions as provided by the Byrnes Directive of Aug. 4.

In the month since WPB provided small manufacturers with a steel reserve of 100,000 tons upon which to draw in making applications, about 44,000 tons of steel have been allotted.

Western Refractory Products Ceilings Receive Adjustment

Washington

• • • Effective Oct. 25, OPA has granted manufacturers of refractory products in Colorado and Utah an increase of 7.5 per cent above their present ceiling prices. The affected products include fire clay, silica brick and specialties used in lining metal smelting furnaces and for other similar purposes. The higher prices, it was said, were necessitated by increased labor and material costs.

Jobbers and dealers will be permitted to add to their present ceiling prices for the products the actual dollar-and-cents increase resulting to them from the adjusted producers' prices. The increase will be absorbed by the industrial users of the products. The increase granted by the action is the minimum amount required by law and will cover production costs plus a normal return to manufacturers in the two states.

Relax Lubrication Equipment Controls

Washington

• • • WPB has announced that production of lubrication equipment is now sufficient to meet essential military and civilian demand and that distributors and jobbers no longer need a preference rating to obtain it. The use of WPB Form 547, distributors' application for preference rating was discontinued for lubricating equipment and lubrication equipment Order L-314 was amended to eliminate the rating requirement and distribution provisions.

Restrictions on Graphite Crucibles Lifted by Order

Washington

• • • Revoking Supplementary Order M-61-a, WPB has lifted all restrictions on the manufacture of graphite crucibles. The order prohibited the manufacture of certain listed sizes of standard crucibles and the manufacture of any type not being made at the time of its issuance.



BULLDOZER
ON MANGANESE: A caterpillar tractor with bulldozer strips and scarifiers manganese ore at Fiddletown, Calif. In spare moments it also doubles up to haul ore 1/4 mile to the bunkers and construct mine roads.

Industry Unity Asked On Subject of Cartels To Shape Foreign Trade New York

• • • Unless American industry can reach its own common conclusions on the subject of cartels, it must "prepare in silence for what it is about to receive, and not undertake to criticize or condemn what other groups with firmer convictions and fewer inhibitions may think and do in the matter," John W. White, president of the Westinghouse Electric International Co., told the convention of the National Foreign Trade Council in New York City recently.

Pleading for industry to unify its voice on the subject, Mr. White, who is chairman of the N.F.T.C.'s international business agreements committee, suggested the formation of a Council of American Industry which would constitute a forum where the ideas and conclusions of individual groups—trade, commercial, economic and cultural—could be considered, discussed, and resolved.

"Conclusions of such a council could well be said to express the statesman-like thinking of all segments of American industry," Mr. White added. "Its overall considerations and conclusions could be implemented in unequivocal phrases of definite recommendations. Such recommendations could and then should be broadcast not as a right of American industry to express its opinion, undertaken with trepidation as to possible retaliatory consequences, but as an obligation, to be exercised in the public interest.

Mr. White characterized current industrial consideration of the cartel problem as having "something of the aspect of the cavalry regiment that was reported to be charging in all directions at once," and said that much of this consideration is "motivated largely by desire to advance individual opinion and personal prejudice, and not to seek out what is good, and good sense, from all sources available.

That the subject of cartels is important to the nation's domestic economy, foreign trade, and even American foreign political policy is shown, Mr. White declared, by the number and diversity of groups and organizations considering it.

Declaring that the subject of cartels "may be of even more importance than we dimly foresee at this time," Mr. White said:

"What our national policies are go-

ing to be on this controversial subject will almost certainly shape not only our foreign trade relations, but to a great degree our political relations with our present friends of the United Nations and even perhaps the future peace of this war-weary world.

"Once industry has taken its own public-spirited stand on this vital subject," Mr. White told the convention delegates, "government in this country should recognize—and indeed in the long run, through the force of public opinion, will recognize—that private enterprise with its long experience in matters affecting foreign trade, in its practical details, can con-

tribute greatly to the national welfare, and to international welfare as well."

But, he added, industry must bring its opinions on the subject into governmental consideration "not as a suppliant, with hat in hand; not as a malefactor, potential or otherwise, whose opinions may only be considered with great suspicion, but as a full-fledged, even if junior, partner of government.

"Private enterprise engaged in foreign trade can well afford to recognize, and indeed must recognize, that any selfish opinions on this subject of cartels cannot receive and actually never will receive public acceptance."

RFC's Plants List Not to Force Sales

Washington

• • • Distribution of RFC's "brief-log" listing DPC's war plants has led to misinterpretation in a few cases, according to Secretary of Commerce Jesse H. Jones, who has issued a statement saying that the offering of these plants for future lease or sale does not mean that production for war is to be stopped in the plants or that workers are to be laid off. Mr. Jones explained that DPC has made a catalog of its plants, giving size and location so that any one who may be interested in one or more plants for postwar use will have the information.

"As a matter of fact," said Mr. Jones, "only one defense plant now in war production has been advertised for sale. That was because the present operators wanted to negotiate for its purchase at this time so as to be able to plan its conversion to civilian production after it is no longer needed for the war effort. The advertisement stated that the plant would re-

main in war production as long as needed and the catalog stated that all plants would remain in war production as long as needed."

Alloy Production Total For September 840,575 Tons

New York

• • • Production of alloy steels during September totaled 840,575 tons, about 12 per cent of total steel production during that month, according to a report by the American Iron and Steel Institute.

In August, 874,716 tons of alloy steel were produced. In September a year ago alloy steel production was 1,023,911 tons.

In the first nine months of 1944, alloy steel production totaled 8,038,394 tons, compared with 10,443,507 tons in the corresponding period of 1943.

Open hearth furnaces produced 557,567 tons of alloy steel in September. The remaining 283,008 tons of alloy steel production came chiefly from electric furnaces.

COMING EVENTS

Oct. 31-Nov. 1-2 — American Institute of Steel Construction, annual meeting, Atlantic City, N. J.
Nov. 2-3—Industrial Management Society, National Time and Motion Study Clinic, Chicago.
Nov. 9-10—SAE Fuels & Lubricants, national meeting, Tulsa, Okla.
Nov. 19—Gulf Coast Chapter, Institute of Scrap Iron & Steel, Inc., annual fall meeting, Dallas, Tex.
Nov. 27-Dec. 2—National Exposition

of Power and Mechanical Engineering, New York
Dec. 4-6—SAE National air cargo meeting, Chicago.
Dec. 10-13—American Society of Refrigerating Engineers, 40th annual meeting, New York.
Jan. 8-12—SAE Annual Meeting, Detroit.
Jan. 10-11—Institute of Scrap Iron & Steel, Inc., annual meeting, Cincinnati.

Gray Iron Founders Study Effect Of Postwar Light Metals

Cincinnati

• • • Amid commendations from President Roosevelt and other top governmental officials for their fine work during the present emergency, members of the Gray Iron Founders' Society, met for two days last week in Cincinnati, for their 16th annual convention. Meeting at the Netherland Plaza Hotel, members of the Society went into a two-day study with particular reference to postwar planning.

Speaking at the opening session, Donald J. Reese, chief of the foundry products section of the War Labor Board Steel Division, said that the nation's prewar production of 10,000,000 lb. a year of magnesium has been increased fifty fold during the war. He also pointed out that aluminum production had multiplied eight times and plastic production increased by 300,000 tons. Competition from these may well be anticipated by the gray iron industry, said Reese.

Adding his warning of a possible postwar competition between malleable iron and the light metal industry, Owen C. Gretton, Bureau of Census, Washington, nevertheless pointed out the need for companies, in such a highly competitive field to keep statistics showing costs and prices in relation to the industry.

In his annual report to the Society, President Walter L. Seelbach of Cleveland, urged foundry operators in each

district to find out what wages they were paying, what they wanted to pay and then go to Washington and fight for what they wanted. At the same time Mr. Seelbach urged co-operation with war agencies by the industry and went on record against making government bureau men, "The whipping boys of our war business." He revealed the annual output of gray iron to be in excess of 14,000,000 tons annually for war and vital home needs.

Discussing the contract training program, Lieut. Col. Francis W. Parker, Jr., Chief of the Training Division, Readjustment Branch, Army, urged the men to insure sub-contractors the same "Fair, fast and final" settlement as prime contractors get and that their representatives organize termination units, probably with a full-time employee and to study all current literature on terminations and seek instruction at field offices of service branches set up for that purpose. He also pointed out that help may be obtained by three-day courses at many universities on the same problem.

The Society, at its closing session, adopted a resolution deploring disclosure by governmental agencies of information furnished by industry on a confidential basis. Several instances of such disclosures were cited in the resolution, including an industry study given to the War Production Board which later was used in a Regional War Labor Board hearing. The resolution, however, did urge the industry to continue to co-operate with governmental agencies by providing complete information in questionnaires.

The association also called upon the Office of Price Administration to co-operate in a publicity campaign to clarify industry regulations and to simplify forms required for relief under regulations governing the foundry industry.

A bright postwar prospect was painted by Edward C. Hoenicke, Detroit, an executive of the Eaton Manufacturing Company. He predicted a large demand from the automotive industry, the railroad and mining industry, pipe lines, electric motors, control devices and innumerable other types of industry.

At its concluding session the industry Society elected Homer Britton of Cleveland, Ohio, a new director, as treasurer and re-elected all other officers. W. L. Seelbach, Cleveland, is president and the directors, besides Britton, are George H. Alten, Lancaster, Ohio; Max Kuniansky, Lynchburg, Virginia; S. T. Russell, Oakland, California; H. A. Stockwell, Cambridge, Massachusetts and L. F. Williams, Grove City, Pennsylvania.

Tin Plate Mills to Have Open Capacity For December Scheduling

Washington

• • • Open capacity for December scheduling will be available in the tin plate industry, members of the Tin Plate Industry Advisory Committee told the WPB at a recent meeting. They pointed out that facilities and manpower have been ample to roll 750,000 tons allotted during the fourth quarter and also will be sufficient if allotments in the first quarter of 1945 are increased. WPB officials said that after all fourth quarter allocations are made, a survey will be taken to see if an additional allotment can be authorized in December.

To conserve manpower, committee members recommended the use of ¼ lb. electrolytic tin in place of special coated ternes for oil cans.

An extra allotment of 3000 tons of tin plate has been made for export in addition to the 149,000 tons allotted for export at the beginning of the fourth quarter, WPB officials said.

They also reported that only a small percentage of the 15,000 tons of black plate which were offered to the industry has been utilized for civilian production under Priorities Regulation No. 25. It was stated that the bulk of these rejects will go to crown cap manufacturers.

NOT A GRAVEYARD: Jeep engines await their turn for complete overhauling at a motor pool somewhere in Italy. The engines have been salvaged from the various fronts in the Italian theater of war and will soon be in service again against the enemy.



War Using Up Supply Of Inventions And Patents at High Rate

New York

• • • War is burning up America's backlog of scientific knowledge and not stimulating research and invention as is generally believed, the National Association of Manufacturers revealed recently.

Not since the first decade of the century has the number of applications for patents and the total of patents granted fallen to the low point of today, according to *Industry's View*, magazine of the Association.

"Only 14,000 patents were issued during the first six months of 1944," the publication states. "This is a reduction of more than 30 per cent from the 21,000 patents issued for the same period in 1939. The rate of decline in patent application is even greater than the decline in patents issued. . . . This is in pointed contrast to the general public belief that war stimulates invention and research."

R. J. Dearborn, President of the Texaco Development Corp. and chairman of the NAM Committee on Patents, cites these figures to show that:

"War stimulates the application of accumulated knowledge rather than the pioneering on the frontiers of science and technology. We are burning up the backlog of scientific knowledge during the war just as we are using up our natural resources. To prevent a decline in the normal rate of scientific and technological progress, incentive must be provided for research and invention.

"This means that patent protection will be more important than ever before, because only through patent protection can a new idea be transformed into a useful product or service for the consumer."

Industry's View points out that "thousands of scientists, engineers and others who are normally the originators of basic scientific and technological knowledge are now engaged in war projects. A large percentage of the 2300 industrial laboratories in the country are devoted to war problems rather than to peacetime research. In addition, thousands of young men who would normally be in peacetime research work have left technical schools and colleges for military service.

"It is vital to the future progress of America that we have a strong

patent system that will stimulate and encourage and provide incentive if we are to regain this lost scientific momentum," the study concludes.

In a chart *Industry's View* traces the rise and fall of patent applications and grants from 1880 to the present and points out these facts:

"The curve of applications apparently has closely followed the rise and fall of prospect for profit. Unfortunately since the beginning of the last depression there has not been the normal rise of patent applications to new highs. On a per capita basis inventions are more than 45 per cent below pre-depression levels.

"Both applications and grants are now as low as during the first decade of the century. This indicates an urgent need for the stimulation of invention and research after the war."

Army Receives GE's 300,000th Bazooka Bridgeport, Conn.

• • • Thousands of General Electric workers were honored recently by Undersecretary of War Robert P. Patterson in a ceremony highlighted by the presentation of the company's 300,000th bazooka to the Army. Patterson on the behalf of the Army accepted the bazooka from the company and told the workers, "the infantrymen were worried because they had no light shoulder weapon to put them on equal terms with the tanks." Today, Patterson continued, there "is one of your bazookas in each platoon and the infantryman is firm and confident in handling any weapon the Germans send against him."

At the present time, General Electric manufactures three different types of bazookas: The paratroop

model which can be folded and is easier to handle than the older type; the flying bazooka for fighter planes; and the newest addition to the family, the portable field artillery bazooka which fires a 4.5-in. projectile. Tubes for the last two models are made from a special paper plastic.

First Six Months Show Seventy-One Steel Fatalities

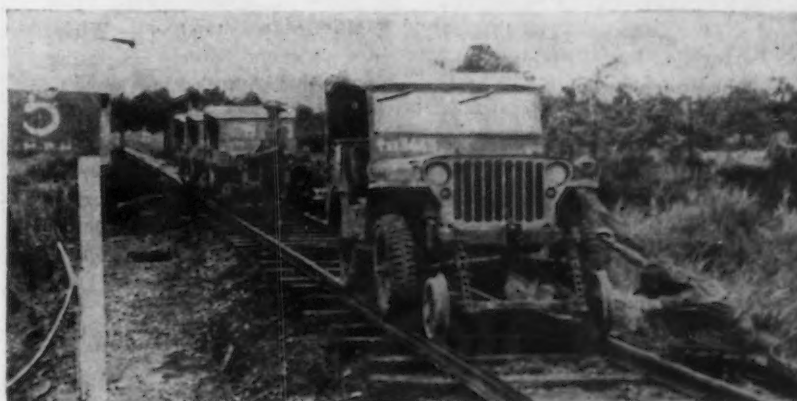
Washington

• • • Accidents in 85 per cent of the steel industry in the first six months of this year numbered 4621 injuries and 71 fatalities, according to the Bureau of Labor Statistics. In 1943, there were 13,005 workers involved in accidents. Approximately 1.7 per cent of last year's accidents resulted in permanent disability or death.

During the steel wage case, the companies told the WLB panel that the union's demand for blanket insurance would cost an additional 5c. an hr. for each worker, while unions insisted that this demand if granted would cost little more than 3c. an hr. more per employee.

Based upon company and union evidence given to the panel, the cost of insurance demanded would be \$55,000,000 according to the companies and about \$33,000,000 according to the union. All states have Workmen's Compensation Acts to pay workers when they are injured and wrongful death statutes provide compensation to next of kin in cases of fatal injuries. Employers are required to contribute to the various state workmen's compensation funds and courts enforce the wrongful death statutes which provide for payments to next of kin ranging from \$5,000 to \$10,000.

BURMA SUPPLY LINE: U. S. Engineers in Burma devised this miniature jeep railway, which moves at a loaded speed of some 20 miles per hr., to keep up the flow of supplies between Myitinka and Mogaung all through the monsoon season.



Industrial Briefs . . .

• **DAILY RECORD**—Colorado Fuel & Iron Corp.'s open hearth department set a new daily record Sept. 22 when 4335 net tons of steel were produced. The company's forge plant also set a shell production record for projectiles of the size produced, when 4935 pieces were made.

• **SELLS ASSETS** — Stokes Industries, Inc., Covington, Ky., have sold their assets to Winfield Baird Foundation, New York. Stokes Industries formerly was known as Sebastian Lathe Co. D. C. Morrison, who had been vice-president, has been elected president of the company.

• **SAFETY AWARD**—Dravo Corp., Pittsburgh, Pa., has the safest dual shipyards in the U. S. The company received this distinction on Sept. 14 when the National Safety Council presented it with the "S" flag for outstanding achievement in plant safety and accident reduction.

• **ACQUISITION** — Milcor Steel Co., Milwaukee, subsidiary of Inland Steel, Chicago, in line with plans for expanded operation after the war, has purchased The J. M. & L. A. Osborn Co., Cleveland. Plans are to continue operations as a division of Milcor, with the present Osborn organization remaining intact.

• **PLANS PURCHASE** — General Electric Co. plans to purchase a 12-acre plot for a postwar manufacturing plant in Anaheim, Calif., for the manufacture of plastics parts for airplanes.

• **NEW OFFICES**—The H. K. Porter Co., Inc., Pittsburgh, has opened an office in Los Angeles and plans to open another in San Francisco. Managed by Harold A. Hitz, the firm will represent the sales engineering services of Porter & Porter Process Division, Mt. Vernon Car Mfg. Co., Devine Mfg. Co., Quimby Pump Co., Fort Pitt Steel Casting Co., and Porter-Blairsville Co.

• **TRADE CENTER**—Plans for the \$35,000,000 financing of a so-called World Trade Center at San Francisco are being discussed here in the East by Leland M. Kaiser, investment broker. Leland W. Cutler is president of the Center and recently head of the Golden Gate International Exposition.

• **REPRESENTING** — Logansport Machine Co., Inc., Logansport, Ind., has announced the appointment of Rudel Machinery Co., Inc., Boston, as exclusive sales representatives for their line of air and hydraulic equipment in the New England territory.

• **CANADIAN DISTRIBUTOR** — Cyclograph Services Ltd., Toronto, Ontario, have been made distributors of Allen B. Du Mont Laboratories, Inc., Passaic, N. J., for cathode-ray tubes, oscillographs and cyclographs in Canada.

• **WAR PRODUCT**—Harrington & Richardson Arms Co., Worcester, have developed a new war product—a line throwing gun kit, which has already been approved by the Navy, Coast Guard, Marine service and Army for varied uses.

• **EXPANSION**—Friden Calculating Machine Co., Inc., San Leandro, Calif., has opened enlarged New York City offices at Madison Avenue, to meet rapidly increasing sales demands in the Eastern section of the nation.

• **MOVES DEPARTMENT**—Wickwire Spencer Steel Co. have moved their purchasing department to River Road, Buffalo, N. Y.

• **NEW COMPANY** — Trumpis, Collar & Associates, Burbank, Calif., have announced the opening of their offices for the purpose of rendering complete, engineering service covering all industrial problems.

WPB Amends L-157 Hand Tools Order

Washington

• • • **Amending Schedule IV** of the hand tools simplification order, L-157, WPB has permitted the manufacture of four types of mine blasting tools—copper needles, copper-headed tamp drills, copper-headed tampers and copper-headed scrapers. The copper-headed tools, formerly prohibited by the schedule, have been provided in some cases through the granting of appeals to manufacturers.

The amended schedule also clarifies permitted use of both carbon steel and NE steels for hot and cold chisels, railroad track chisels and certain types of mauls and blacksmiths' double-faced sledges. All other items covered by the schedules may be made of only one kind of steels.


Tin Smelting

(CONTINUED FROM PAGE 61)

francite and other complex ores. These processes, epitomized in the American Longhorn tin smelter in Texas, vary quite a bit from the traditional and comparatively simple extraction procedures followed in the smelter of Straits Trading Co. and the English plants.

Four general methods were mentioned as the general approaches to smelting processing: 1—Roasting followed by further mechanical separation of minerals that have been physically broken away from the cassiterite as the result of the process or altered in such a manner, that is, as change in specific gravity, making them more amenable to further mechanical concentration; 2—roasting under controlled conditions, followed by leaching with water or acid solutions; 3—heating with sodium salts such as soda ash, sodium chloride, salt cake, etc., followed by leaching; and 4—metallic impurity removal by oil flotation when the impurities are present as sulphides. The three stages in the smelting of tin ores or concentrates consist of reduction, or tin smelting proper, cleaning the slags and furnace linings and recovery of tin from them, and refining the impure tin.

The Longhorn smelter follows a method in reducing Bolivian ores, which in some degree is a modification of that used at the Arnhem smelter, Holland, operated by Billiton Co. The author described this process, as shown in the accompanying illustration.



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Steel Industry Gives Serious Thought to Postwar World Markets

By T. E. LLOYD

Pittsburgh

• • • Serious thought is now being given by the steel industry to the domestic and world markets after the close of the war in Europe and after the end of fighting in the Pacific and China. This is evidenced at every turn, with producers reassembling sales staffs, lining up market research departments, checking over production facilities to determine which are high cost and which are low cost operations, and, in general, working with an eye to postwar business.

Economists the country over are examining reams of data in an attempt to glean a look into the future business cycles of American industry.

On the whole, there are some pretty concrete facts with which these experts have to work, and some of their predictions, while sounding exaggerated, are based on firm and clear thinking.

One of the outstanding estimates of some 30 of the country's leading financial and industrial economists is that during the 10 years following the close of the war, presumably from 1946 through 1955, the national income will average \$133 billion a year, a substantial rise from the \$83 billion income of 1939. This will include the up and downs during that period, since it is stated as an average income. Typical of the individual yearly estimates

is the Brookings estimate of a few days ago for 1947, when the national income was set at \$147 billion.

With this huge national income, these economists expect that the steel industry will participate to the extent of an average of 71,000,000 net tons of ingot, or 50,000,000 tons of salable finished steel per year. Other industries, of course, will participate to a corresponding degree.

An examination of what 71,000,000 net tons of ingots per year really mean is interesting. During the 10-year period from 1930 to 1939, that amount was just short of the total yearly capacity of the steel industry, and 23 per cent greater than the best yearly output of steel, which was in 1937 when some 56,000,000 tons were produced. Based on the present 94,000,000 net ton capacity of the steel industry, 71,000,000 tons means that during the 10 years following the war, the industry will have to maintain an average yearly operating rate of just about 75 per cent. This might be considered pretty close to the optimum operating rate of the steel industry, because the closest estimate of the break-even point at present, based on present labor and material costs, is somewhere in the neighborhood of 60 per cent operations. Also, when it is considered that on steel production alone there is a top break-even point, above which steel production alone becomes decreasingly profitable, a 75 per cent operating rate is highly desirable.

To warrant and support this rate of production, because without sales there is bound to be a drop in production, the industry points to three factors. First, there is a healthy pent up demand for civilian products backed up by an accumulation of money that could not be spent during the past four years. Second, this pent up demand will create an immediate high employment rate which, it is believed, can be sustained. Third, there is a growing belief that private industry and management has profited by past experience and can and will be able to combat forthcoming downward trends in business successfully.

To bolster these arguments and verify their claims of a huge pent-up demand for manufactured products, economists and steel producers have carefully examined the potential demands on several industries, and these studies are continuing. In the construction field, the public works projects that have been held up by the war will be reinstated, and many

THUNDERBOLTS IN INDIA: *Nearing the end of their 19,000 mile trip to the fighting in the CBI Theater, P-47 fighter planes move down the streets of Karachi, India, after unloading in the harbor.*



For

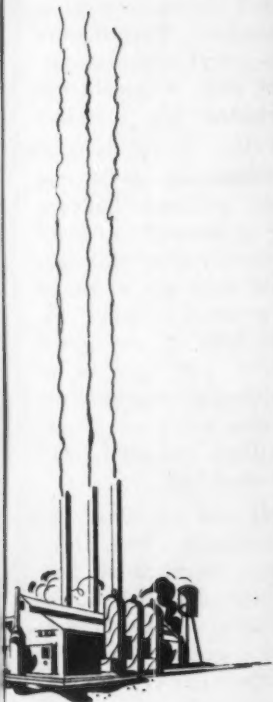
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SELF ALIGNING ROLLER BEARINGS

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municipal and state projects are now contemplated that are completely new. There are very few large cities in the country that have not already announced "face-lifting" programs. Also, it is believed that the construction of at least 1,000,000 homes a year for 10 years is not at all unlikely, provided these units are in a price range of from \$4,000 to \$6,000 each. This, to be successful, will necessitate some sort of prefabrication. That doesn't necessarily mean completely prefabricated houses, but units within homes can be prefabricated and installed quickly and cheaply.

The oil and automobile industries are closely linked, and auto builders now are figuring on more than 6,000,000 cars a year shortly after the war. This alone would consume close to 12,000,000 tons of steel a year. To supply these cars with oil and gasoline, more oil fields will have to be opened, and equipment-starved oil producing companies will have to obtain far more drilling and piping facilities than they ever had.

The agricultural and container industries are also closely allied. Devastated farm areas throughout Europe and Asia, and depleted farms throughout the rest of the world, are expected to create a greater farm implement industry than has ever before been known. The rehabilitation of the farm areas in Europe alone could maintain a good sized industry for many years. As this country will feed much of the world for several years to come, the container industry will fare better than ever before. Even with the development of dehydrated foods, containers, many of which will be metal, are necessary to transport these items to points of consumption. Furthermore, the preparation of such items will require considerable in the way of equipment, as will the manufacture of greater numbers of containers for wet packs.

Industrial companies the country over for the past four years have run equipment to the breaking point, and with very little maintenance. This equipment in many instances is ready for the junk yard; and industrial buying will be tremendous. An example of this is a partially completed survey on boilers that currently indicates that upward of 50 per cent of the boilers and auxiliary equipment is badly in need of major repairs.

While there are many standard machine tools that will be let loose from government owned war surpluses, the need for special tooling is still exten-

Your Post-War Products May Never Have To Stand the Strain of a Power Dive.....

yet they must be fastened to endure lifetime use and abuse. That extra measure of strength and precision which insures endurance beyond ordinary demands is a built-in quality of all HOLTITE screws, bolts and allied fastenings. You can "drive'em and forget'em" with absolute assurance of their trouble-free performance.

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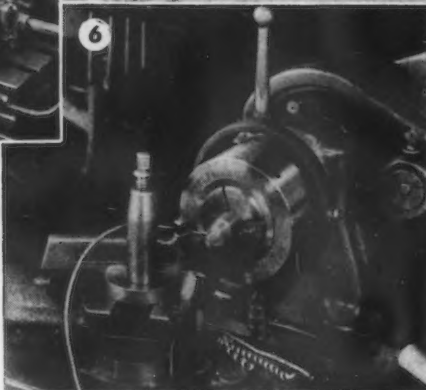
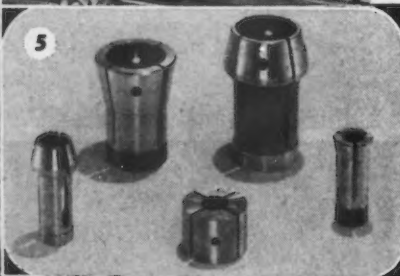
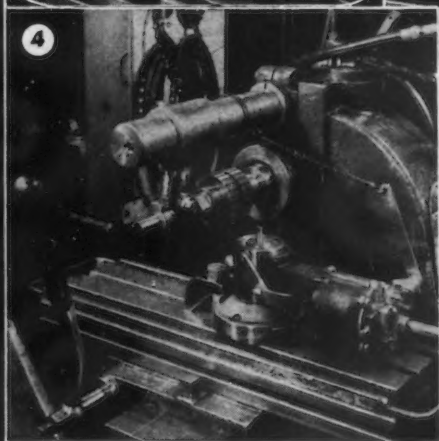
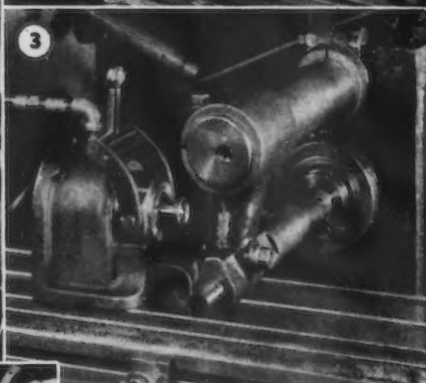
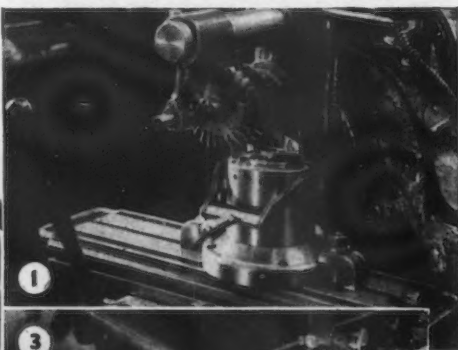
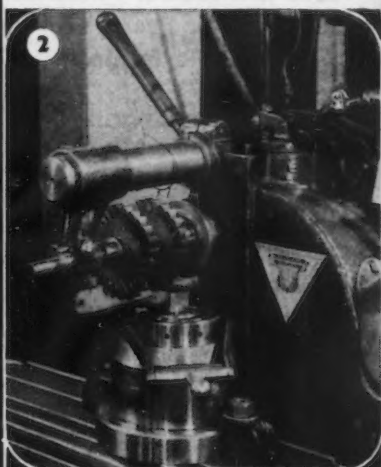
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Zagar

INDEXING HOLDING COLLET FIXTURES

sive. To reconvert to peacetime production, industry will be in the market for special tools. One major automobile producer alone has recently indicated that to get back into automobile production, it will require one-third more machine tools than it now has in its plants, all of which will be of special types. This bodes good not only for the machine tool industry, but also for the manufacturers of machine tool attachments and cutting tools.

Railroads have, for the most part, already shown signs of what they intend to do after the war. Their rolling equipment and trackage has been run to the junking point, and a market for close to 100,000 cars a year for 10 years is believed to exist. Already, roads are placing orders for cars and gladly taking as much rail and track accessories as they can obtain. Aircraft, while it may not be as great an industry as some of its proponents would like to believe, will be an important factor in transportation. The mortality rate on aircraft builders may be high, but when the first wave of business failures or conversions to other production is over, it might be found that American aircraft producers will supply a large part of the world's peacetime aircraft. An expansion of this domestic business will effect a market for practically all metal working industries in the country.

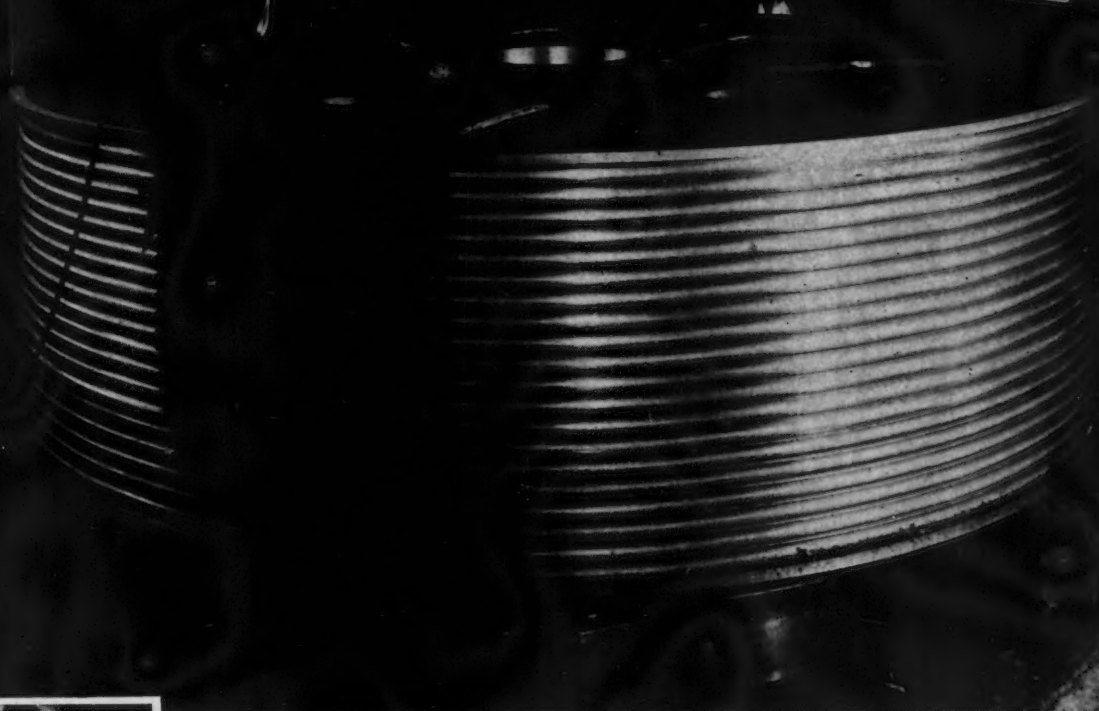
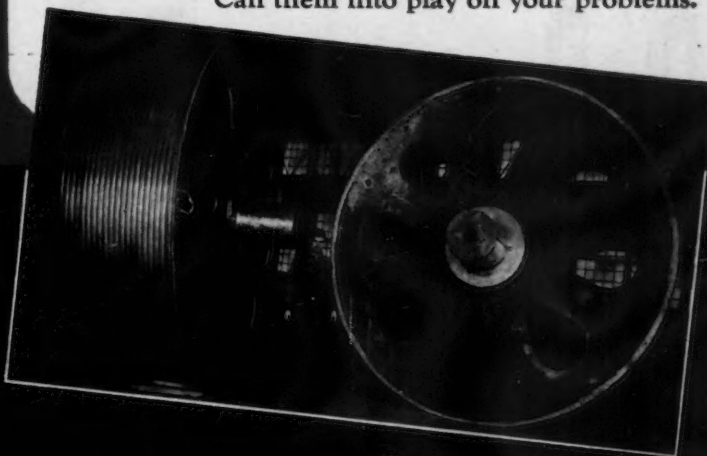
Steel producers are already casting covetous eyes on the export market. While there are many barriers to hurdle here, such as tariffs and reciprocal trade agreements, as well as competition with nations whose labor costs are a mere fraction of those in this country, steel producers are still confident that American steel will find its way in huge quantities to the various nations of the world. Export divisions and departments are being revived and rejuvenated, and the machinery for world trade is being oiled.

First, there is the reconstruction and rehabilitation program of Europe that looks promising. If the Ruhr is completely demolished in taking Germany, this task will be more momentous than now imagined. In this market will be the American and British, and, possibly, Russian steel industries. The British, always sharp traders and expert exporters, might well try to dominate this market. While Eric Johnston, president of the U. S. Chamber of Commerce, recently reported that Stalin is not interested in exporting steel after the war, there

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LARGE

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This rope drum for a vertical lift bridge runs to size—about 25 tons. You can appreciate its dimensions and the machining job it entailed from the photos, and you can also get an idea of the clean soundness of the metal structure. What you can't see is the fact that every pound of it had to be—and is—completely stress-relieved. PSF has all the advanced technique and facilities needed for any steel casting production, no matter how involved. Call them into play on your problems.



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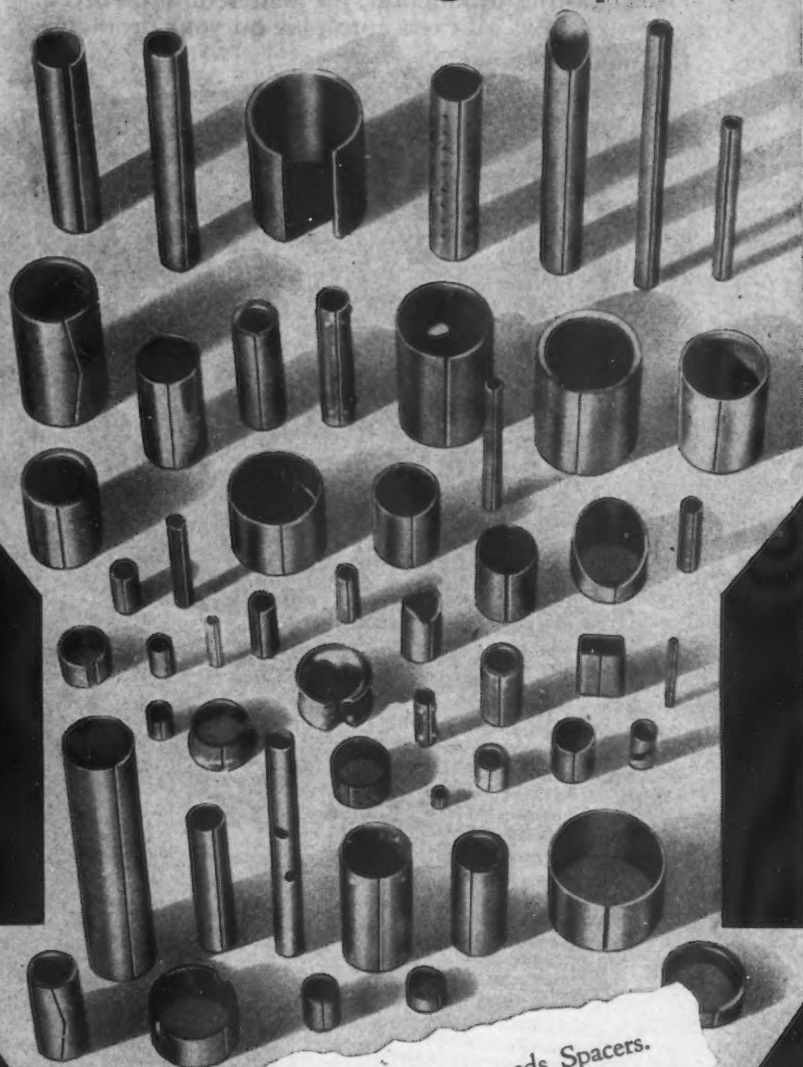


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is no certainty that he won't change his mind with such a huge market in his own back yard.

South America, always a big importer of steel products, has been on short rations for some time, and heavy exports in that direction can be expected. As to the Far East, mainly China, there are great hopes here, but it is believed that education of the masses in that country is necessary before much can be expected in the way of improvements either in the standard of living of the Chinese people or in the industrial setup of the nation.

From these outlets, an annual steel production of 71,000,000 net tons and an average national income of \$133 billion are expected to result. Some might call it wishful thinking, but it is the kind of thinking that will at least start the wheels going.

Standardization Is Saving 15 Per Cent In Bar Production

Washington

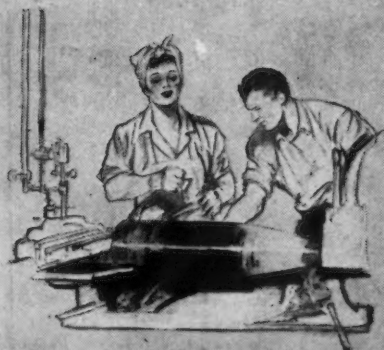
• • • Standardized production of hot rolled carbon steel bars set-up under L-211, Schedule 15, has proved so beneficial that its continuation was recommended at a recent meeting of the Carbon Bar and Semi-Finished Steel Industry Advisory Committee, according to a WPB statement. Benefits from the schedule's restrictions by one mill, it was stated, indicated that a reduction of 48 odd sizes resulted in a net increased production of approximately 15 per cent in two of their bar mills.

Committee members also emphasized that space directives on mills producing steel for further conversion should not be removed as long as current shell steel and other urgent requirements exist.

Carbon steel bars and semi-finished products, several members reported, are still in steady demand. They said that present mill loads indicate deliveries on bar mill products can be made well through the first quarter. The government presiding officer said that shell steel requirements remain heavily programmed, demanding production space in mills able to produce the required sizes.

The Treasury Department, he added, may be able to undertake the purchase of lend-lease requirements without definite mill space reservations after Jan. 1.

John V. Burley was introduced as a new member of the committee.

Machining an
8-inch shell

STEEL SERVES THE GUNS WITH MILLIONS OF SHELLS

Steel moves along shell production lines in a smooth, continuous flow. Each operation brings it nearer the size and shape used to drench the enemy with destruction—at lowest cost in American lives.

Converting steel into many different types of shells by the millions calls for adaptability of resources and equipment, for ability of management to solve new production problems quickly, and for resourcefulness of men and women workers in mastering new skills and methods.

The American *will to do*—at J&L and throughout the steel and allied industries—is such that the shell program keeps pace with the changing needs of the armed forces and supplies the guns as the gunners serve them—swiftly, accurately, with devastating effectiveness.

JONES & LAUGHLIN STEEL CORPORATION



PITTSBURGH, PENNSYLVANIA

CONTROLLED QUALITY STEEL FOR WAR

Inspecting 105 mm shells



Pressing rotating bands on shell



BIG SHELLS SAVE LIVES

"Black Panther," invasion pin-up gun, is an Army Ordnance 8-inch 23-ton mobile weapon that fires 256 pounds of steel and high explosive a distance of 20 miles so accurately it will drop its big shells "right on the courthouse steps." This gun out-ranges Germans' best gun by 2 miles, fires shell 100 lbs. heavier. Half the total production of steel shells is being made in Pittsburgh Ordnance District for the "Black Panther" and the 14-ton, 8-in. howitzer on wheels, maximum range 10 miles.

Cannon derives from "kanna," Greek for tube, literally a hollow reed, like bamboo.

Drenching the enemy with big shells to save American lives was theme of a demonstration-conference Army Ordnance Chiefs recently held with other shell manufacturers at McKeesport (Pa.) Works of Jones & Laughlin Steel Corporation. Led by Maj. Gen. Levin H. Campbell, Chief of Ordnance, and Brig. Gen. R. E. Hardy, Chief, Ammunition Branch, the party inspected plant where bomb line was converted to artillery 8-in. shell line (see illustration) in record time.

Propaganda shot to enemy in howitzer shells is working to break Axis morale, the army reports. 105mm shells, (over 3 million produced in J&L McKeesport Works), are timed to burst over enemy territory, scattering printed leaflets telling truth about war. They are well received, prisoners report.

Gun barrel got its name from 14th century Flemish weapons made of iron strips fashioned into long tubes and bound by hoops, like wine casks or barrels.

First gun using powder was built in Flanders about 1314. Called "fire pot," it was shaped like a vase, shot heavy, 4-sided, iron-headed arrows, was fired by wary gunner with lighted taper, who touched priming powder—and ran.

Gunpowder not Chinese invention, in opinion of many historians. Some give credit now to Roger Bacon, English author and alchemist (1214-1292).

First shell forgings for this war made on an upsetter were produced by J&L Aliquippa Works in 1940 for British 6-inch shell. Using peace-time machinery without conversion, these forgings effected a substantial saving of steel. Aliquippa and Pittsburgh Works of J&L, as well as McKeesport Works, are furnishing great quantities of bomb casings, shell blanks and fragmentation bombs.

"He shall flee from the iron weapon and the bow of steel shall strike him through" (Job, 20, Oxford Bible) is one of few references in Scriptures to these metals applied to weapons of war. This prediction of startling timeliness foretells that: "The triumphing of the wicked is short. Though his height mount up to the heavens and his head reach into the clouds, yet he shall perish forever. And the earth shall rise up against him."

3,286,212
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... are hitting
the target!

We don't know how many plug gauges laid end to end it would require to reach Tokyo or Berlin, but we do know that we made 3,286,212 steel and chrome plug gauges to check many types of war implements that do reach our military objectives.

Yes, *precision* has become the watchword of industry during this war, and it will continue to be a factor in those industries that will be the leaders in peacetime production.



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Master Discs,
Built Up
Gauges

NEWS OF INDUSTRY

Factory Employment And Production Stay At Near Peak Levels

Cleveland

• • • A year has passed since the peaks in war time industrial production and factory employment were reached, according to Brig. Gen. L. P. Ayres, vice-president of the Cleveland Trust Co., but despite gradual decreases in both employment and output both have remained at extremely high levels. A study of available data relating to employment before the war and the employment picture now suggests that no serious adjustments will be required in about half of this country's economy, but very difficult changes will be needed in the remainder.

In the diagram, the columns represent (in millions) employment in the United States in June, 1940, and June, 1944. Employment in the armed services is included, and inclusion is also made of the members of the labor force who were unemployed but were seeking work.

	1940	1944
Armed Services		11.6
Government	4.1	5.9
Unemployed	8.6	
Manufacturing	10.5	16.1
Transportation Pub. Utilities Construction & Mining	5.6	5.3
Finance, Service & Misc.	4.3	4.3
Trade	6.9	7.0
Agriculture	11.0	9.6
	1940	1944

Unemployment dropped from 8,600,000 to only 1,000,000, the bulk of which was absorbed in the manufacturing industries and the armed services. Agriculture employment dropped from 11,000,000 to 9,600,000 is a notable factor. Probably the farms will be able to support as many people after the return of peace as they did in 1940, Gen. Ayres said, but agriculture is clearly going to be troubled by the problems of overproduction. Manufacturing employ-

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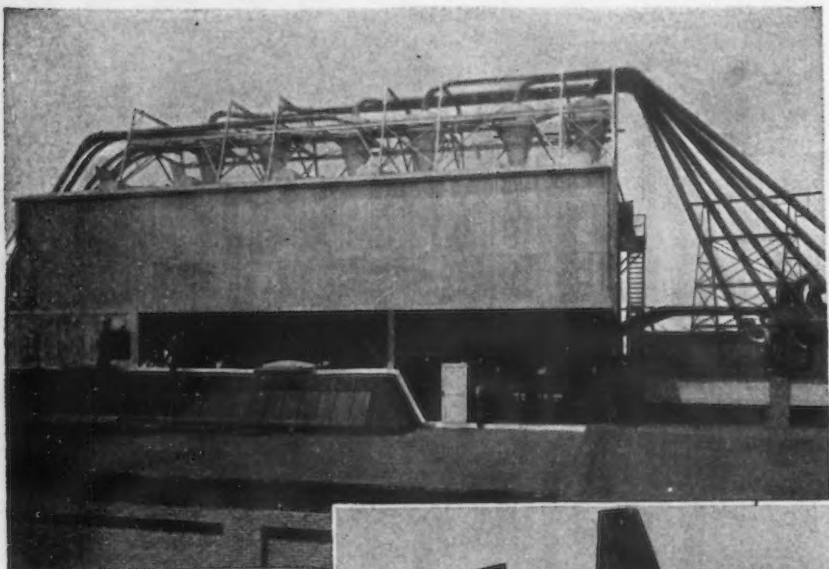
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the Army-Navy white star
for continued excellence

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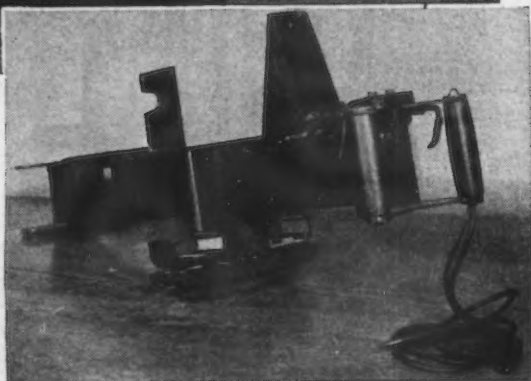
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ment poses a peculiar problem. As it increased over 50 per cent during the war years, the difficulty is that most newcomers are making commodities not used in peacetime. Gen. Ayres expects that manufacturing industries will have to release about 4,000,000 employees after the war, and half of that number are now making ships and airplanes. A substantial portion of this layoff is expected to come from these two industries.

Chemical Industry Show Will Include All Metals Program

Chicago

• • • Eyes of the industrial chemical world will focus Nov. 15 to 19 on the National Chemical Exposition and the National Industrial Chemical Conference to be held at the Coliseum in Chicago.

Highlighting the five-day meeting will be the industrial conference with daily programs to be addressed by noted authorities from many sections of the country. Prominent among the speakers will be Charles F. Kettering of General Motors Corp., who will make the main address at the dinner meeting of the Chicago Section on Friday evening, Nov. 17.

Preceding the opening of the conference at the Coliseum on Wednesday afternoon, Nov. 15, a joint luncheon will be held at noon on that day at the LaSalle Hotel with members of the Chicago Association of Commerce and the Chicago Section taking part. "New Research Developments in Industry" will be discussed by Roy C. Newton, Swift & Co.; J. K. Roberts, Standard Oil Co. (Ind.) and Ernest H. Volwiler, Abbott Laboratories. Mr. M. H. Arveson, chairman of the Exposition, will preside.

The conference and exposition programs, devoted to the field of applied chemistry, are designed to be of interest to chemists, engineers, bankers, educators, manufacturers whose processes in some way involve the use of chemistry, and all those holding technical and management positions.

Of particular interest will be a metals program to be held Wednesday evening, Nov. 15, at 8:00 P. M. The chairman will be C. W. Balke, of Fansteel Corp. The program will include "New Developments in and Future Developments for Aluminum," by P. V. Faragher, of the Aluminum Co. of America; "Magnesium in Peacetime Economy," by L. B. Grant of the Dow Chemical Co.; and "Hard-

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HEAT-TREATING at

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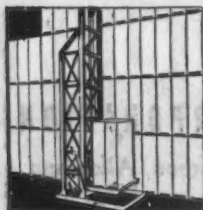
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NEWS OF INDUSTRY

enability Bands for Alloy Steels" by J. Mitchell, of the Carnegie-Illinois Steel Corp.

The show committee, of which M. H. Arveson is chairman, announces that additional space has been made available to prospective exhibitors by the leasing of the North Hall. "This added space expands the show to more than twice the size of the last national chemical exposition held by the Chicago Section in 1942."

Exposition exhibitors will represent all phases of the industry including chemical companies, machinery and laboratory apparatus. The exhibits will stress the extraordinary properties of materials and uses of equipment, in order that the show will be strictly in tune with the ethics and objectives of the sponsor, to foster chemistry and its application.

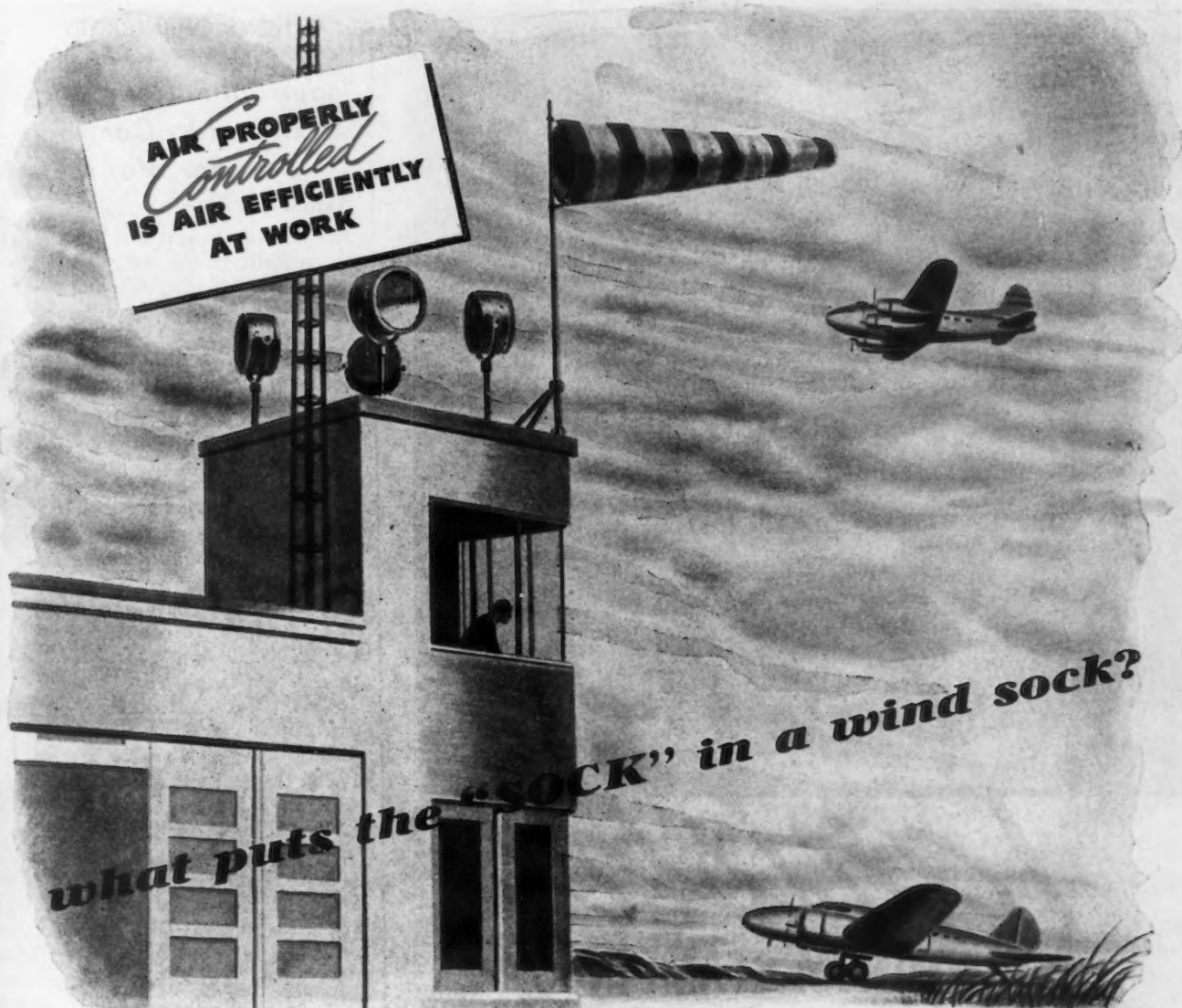
Twenty-seven industrial films have been approved by the show committee to be shown in the movie theatre in the Annex. These films cover a wide range of subjects including such topics as metals, plastics, abrasives, explosives, pharmaceuticals, synthetic rubber, petroleum products and blood plasma. The films selected range from those of wide popular appeal and general interest to specialized technical subjects. None of the films has been shown at any previous national chemical show.

50,000 Tons of Steel Saved in Shell Makings Butler, Pa.

• • • More than 50,000 tons of steel, costing more than \$2,472,000, have been saved by the Pullman-Standard Car Mfg. Co.'s Butler Plant in the manufacture of heavy artillery shells. The saving represents the reduced amount of steel needed because of an improved shell-making process pioneered by the company.

The huge savings of steel resulted from the adaptation by Pullman-Standard of the British roller draw bench, whereby it is possible to produce 155 mm. shells from a 119 lb. billet instead of the 150 lb. billet formerly used. Proportionate savings were also made in all other types of heavy artillery shells.

The Butler plant has manufactured 22 different types of heavy artillery shells since the outbreak of the war and has further been repeatedly called upon by the government to produce shells that necessitated a constant shifting around of equipment and changing of production lines.



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THE IRON AGE, October 26, 1944—135

Industrial Pattern Shifted by Contracts For War Materiel

New York

• • • War production has caused a major shift in the industrial pattern of the country that is bound to affect business and living conditions in entire regions in the postwar period, according to a study made by the National Industrial Conference Board.

The greatest regional changes have occurred in the Pacific and Mid-Atlantic areas, one having increased, the other decreased, its share of the nation's total of industrial activity.

The Pacific area, embracing California, Oregon and Washington, contributed about 6.5 per cent of the nation's industrial output in 1939. By June, 1944, it had received about 13.5 per cent of all war contracts, or more than double its prewar share.

This great concentration of contracts has exercised a tremendous influence on the business life of the Pacific region, for income payments rose from 9.6 per cent in 1939 to 12.1 per cent in 1943, and retail sales from 10 to 12 per cent.

Across the continent, the three States of New York, Pennsylvania and New Jersey have together suffered the greatest relative loss since 1939. This Mid-Atlantic region contributed about 30 per cent of all national manufactures in 1939. But at the end of June, 1944, it had received only 23 per cent of all war contracts. Its share of national income payments in this period fell from 29.7 per cent to 25.3 per cent, and that of retail sales from 24.5 per cent to 22 per cent of the 1943 national total.

These shifts in relative business activity have "created new regional concentrations that will make for serious dislocations in the period of reconversion," according to the analysis, and companies will have to set up new regional sales quotas and obtain new distributive outlets to make full utilization of changes in regional population and buying power.

An analysis of war contract awards by states shows that 21 have benefited in proportion to their relative manufacturing standing in 1939. The bettered position of Washington, Oregon and Mississippi is reflected in a higher percentage of income payments, retail sales, payrolls and electric power consumption in 1943 than in 1939. In California, Maryland and Arizona, only nonwar industry payrolls slumped, and in Connecticut and Michigan only



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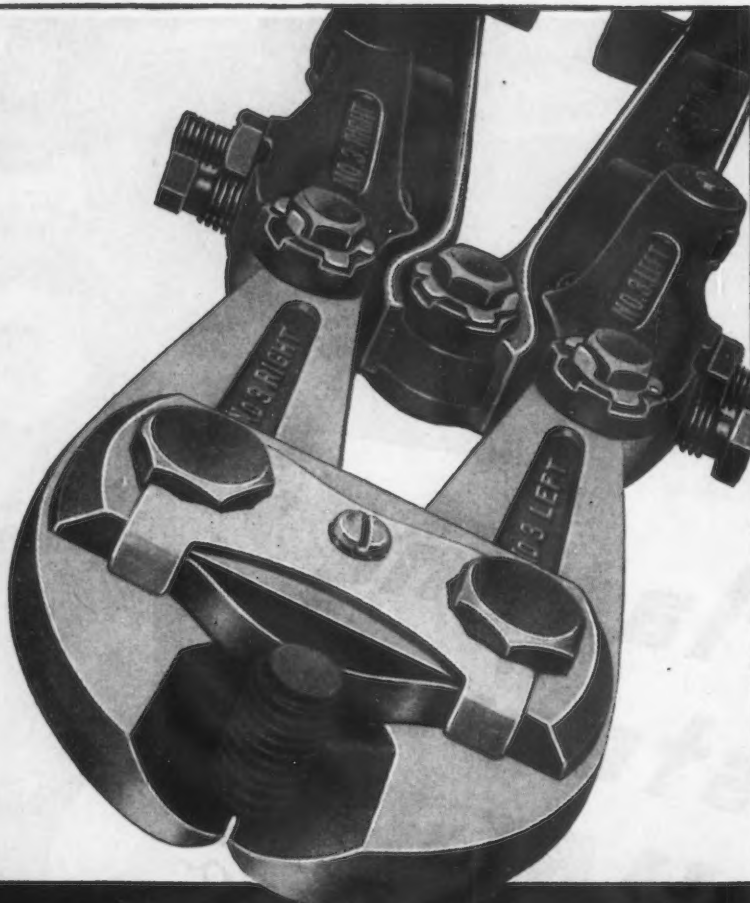
Western Representative: F. Samers Peterson, 57 California St., San Francisco, Calif.



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Write for Porter Catalog, illustrating and describing the Porter line — also a free copy of Tool Maintenance Book — a practical manual on the use and care of clippers, saws, chisels, files, and other hand tools. A request on post card or letterhead will bring it without charge.

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PORTER HKP CUTTERS

war industry payrolls were relatively lower. Kansas and Louisiana experienced a relative drop only in electric power consumption.

But in 11 of the 21 states, heavy war contract awards have not been sufficient stimulus to raise general business activity above the 1939 share of the national manufacturing total.

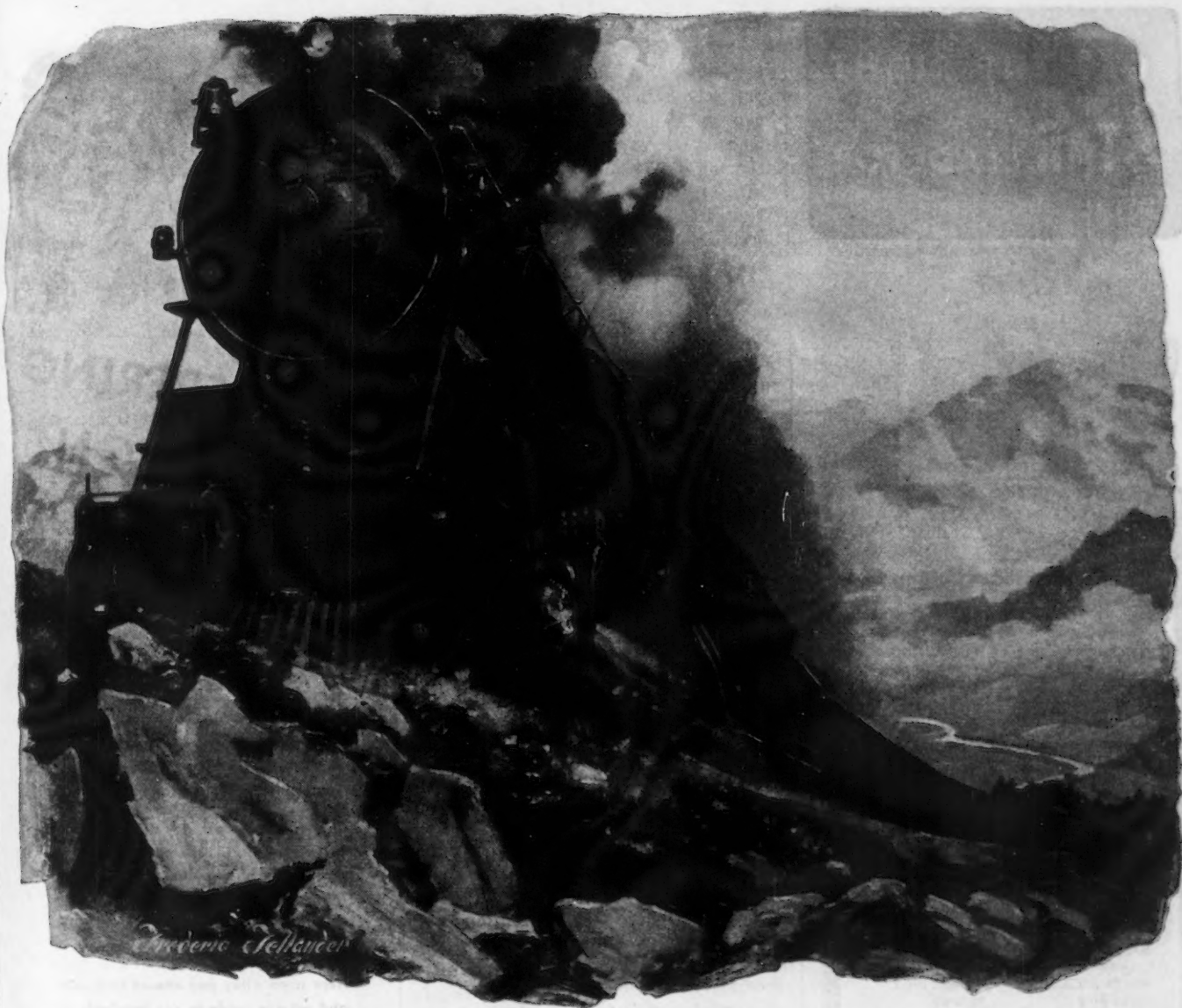
Attacking the Steel Industry Appears To Be Worldwide Habit New York

• • • American steel men are prone to believe that they are too often singled out as a whipping boy by politicians and hostile groups. Such an opinion is supported by the record in the past several years. First the industry was accused of having too much capacity then later it was accused of having too little.

But the truth of the matter is that apparently the steel industry of any country is fair game for those who must have a punching bag. The following quotations are from the British paper, "The Metal Bulletin":

"In certain quarters there is a disposition to criticize British steel prices as being excessive. Without going into the pros and cons of the matter, we would like to point out that these critics rarely or never refer to the rising cost of the items which make up the industry's costs, like coal and labor, over which it has no control. As a matter of fact the steel industry has taken the shock of a number of fuel price advances and also increases in wages without asking consumers (who are at the moment mainly Government Departments and therefore the taxpayers) to pay anything extra for their supplies. The industry claims that it is not making very much if any profit at present selling prices for steel.

"Perhaps some of the critics of the steel industry would care to look into the question of fuel prices and other costs which bear hardly on the iron and steel works of this country. But perhaps this wouldn't be such good politics as attacking the steel industry, which from any angle is always a tempting target for the unthinking. This seems to be true of any steel industry in any country. We hold no brief for instance for the French Comité des Forges, which has latterly been more or less openly accused of collaborating with the Germans during the occupation of France by the



OVER THE HUMP! America's miracles are no longer news—its record in this war is a succession of miracles. But there is one accomplished "impossibility" which deserves special mention: *The job our Railroads are doing!*

Shortage of equipment and depletion of man-power notwithstanding—they have climbed the grade with "know-how," courage and patriotic devotion.

Raw materials have been delivered to our war industries—on schedule. Finished weapons have appeared—when and where wanted—as if by magic.

Millions upon millions of troops have been

transported punctually and without incident. Meanwhile, somehow, our civilian needs have been met.

All in all, a feat of logistics that staggers the imagination!

HOUDAILLE★ salutes the *Railroads of America* for distinguished service, above and beyond the line of duty. Never before has their place in our national economy, in our way of life and in our hearts been so secure.

We of Houdaille are proud to have served the Railroads in the past. We are serving them now. We hope increasingly to serve them in the great, new America, after this war is over.



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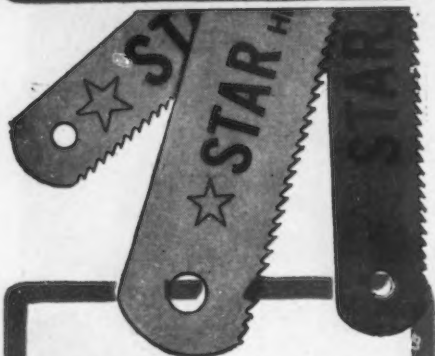
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Hand Hack Saw Cutting of

ALUMINUM	METAL TRIM
BRASS	PIPE TUBING
CONDUIT	SHEET METALS
COPPER	SOFT STEEL
DRILL ROD	STEEL PIPE
HARD ALLOYS	THIN TUBING
LIGHT ANGLES	THIN METAL WALLS

TOOL STEELS

Power Hack Saw Cutting of

BRONZE	PIPE
CAST IRON	RAILS
HARD ALLOYS	SOFT STEEL
(Med. Dia.)	TOOL STEEL
HARD ALLOYS	(Large Dia.)
(Large Dia.)	TOOL STEEL
HEAVY ANGLE TRIM	(Med. Dia.)
IRON PIPE	TUBING
LIGHT ANGLES	WROUGHT IRON

Band Saw Cutting of

ALUMINUM	DRILL RODS
BRASS SHEETS	IRON SHEETS
BUILDER'S BOARD	METAL WOOD
CAST IRON	MONEL SHEETS
COPPER	PIPE

ZINC



This metal cutting book tells you the proper selection and use of Hand and Power Hack Saw Blades and Flexible Back Band Saws for the materials you cut. Send for your copy. **Clemson Bros., Inc., Middletown, N. Y.**

*T. M. Reg.—Blades bearing the name "MOLY" are made only by **Clemson Bros., Inc.,** and affiliated companies.

CLEMSON

Makers of Hand and Power Hack Saw Blades, Frames, Band Saws, and the Clemson D-17 Lawn Machine

Germans. A reader with a good memory, who by no stretch of imagination can be called pro-German, recently pointed out to us that only a generation ago the Comité des Forges was being accused of being behind the French occupation of the Ruhr. That occupation was bitterly resented and opposed by the Germans and was as far removed from Franco-German collaboration as anything could be. But the French steelmasters were bitterly attacked all the same, though on quite different grounds, from those on which they are being criticized today."

GI Engineers Build Bamboo Water Line To Supply Mess Hall Southwest China

... From the "end of the line" in China comes a story of supply problems and Yankee improvisation of interest to all pipe makers in the country—how a 600 ft. pipeline of bamboo sections has been laid by U. S. Army engineers.

Out to the end of the line is by far the longest supply route in the history of American military operations, 19,000 miles of water, rail and air, where supplies cannot be delivered just because they are needed, but must be indispensable before they are transported. Even then they cannot always be lifted over the "hump" by air immediately. It is always a matter of determining which is needed most—tail gunner, medicine, trucks, emergency rations, bullets or pipeline.

Down a mountain slope in southwest China, back of the ground fighting on the world's highest and toughest battleground, the 12,000-ft. Kaoli Kung Mountains, west of the Salween River in Yunnan Province, China, there is a 600-ft. water line which illustrates the soldier ingenuity that is required. This line releases many Chinese coolies from carrying water and who are needed for duty as burden carriers where even pack animals sometimes cannot go in support of mountain combat units.

The water line was needed between a spring and an Army mess of Y-Force Operations Staff. At a military post in the United States that 600 ft. would be spanned by 678 lb. of ¾-in. water pipe. In China both pipe and shipping space was needed for 678 lb.

That 678 lb. represents 7500 rounds (or five cases) of .30 caliber ammunition, which might win another mountain height for the Chinese armies fighting west of the Salween River to



WHISPERING CAMPAIGN

Word of mouth travel has built up a list of almost 1,000 users of Strenes metal ranging over 36 states, employing this unusual alloy in many ways.

Its principal use is for drawing and forming dies . . . body tops, fenders, radiator grills, hoods, lamps . . . refrigerator tops, sides, doors, trays . . . stove parts, tractor parts, farm implement parts, caskets, grave vaults, etc.

Strenes can be cast very close to shape (usually ⅛") . . . thereby greatly reducing machining time. Its graphitic lubrication rate is very high, hence runs of 1,000,000 deep draw parts are not unusual.

Here is an alley you should look into and we are ready to cite hundreds of plants for you to contact on the subject.

Also . . . no matter how extensive your tooling program Advance has the capacity to handle the casting and give you excellent service.



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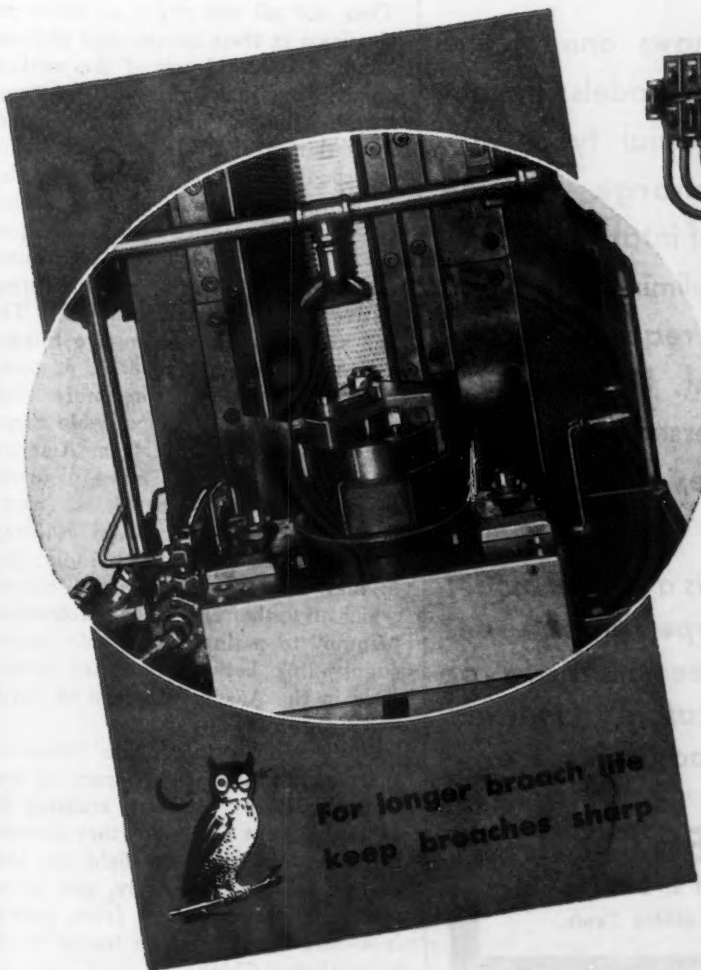
The advantages of broaching by American are well known to the Nation's leading manufacturers. Almost every war industry has made use of broaching, the American way, to secure fast, accurate, economical output.

For example, American Broach and Machine Company engineers recently designed the broach tooling and setup for the production of a new aircraft part. One operation entails the finishing of the external contour of a two-part stop sleeve.

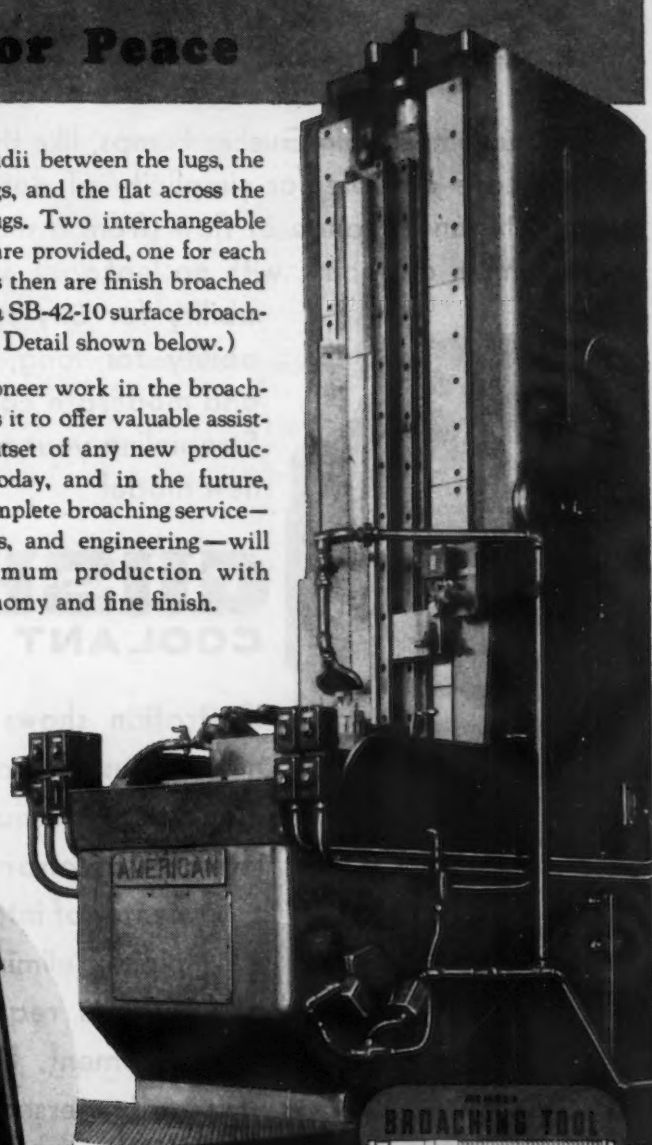
An American SB-66-15 surface broaching machine (shown at the right) rough

broaches the radii between the lugs, the sides of the lugs, and the flat across the index of the lugs. Two interchangeable tooling setups are provided, one for each part. The parts then are finish broached on an American SB-42-10 surface broaching machine. (Detail shown below.)

American's pioneer work in the broaching field equips it to offer valuable assistance at the outset of any new production effort. Today, and in the future, American's complete broaching service—machines, tools, and engineering—will provide maximum production with maximum economy and fine finish.



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keep broaches sharp

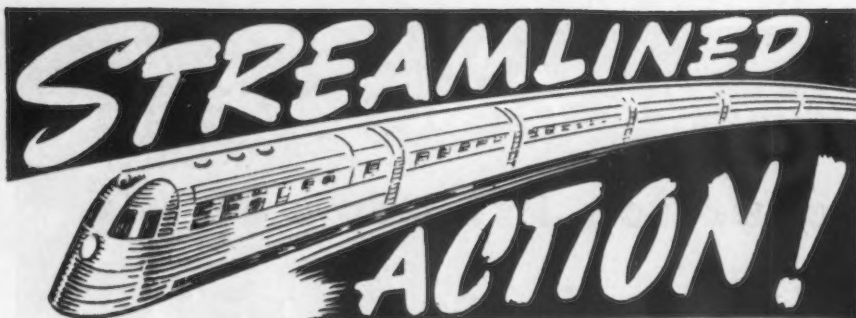


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**BROACH AND
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The new models in Gusher Pumps, like their predecessors, are notable for simplicity of design, minimum maintenance, range of flow (from a mere dribble to maximum capacity, with no leakage), varied adapt-

ability for any type machine, ability for long, hard usage, and moderate cost.

Streamline your machines with new model

GUSHER COOLANT PUMPS

Illustration shows one of the newer Gusher models: flange-mounted, external type, with internal discharge (through center of intake). Outside piping eliminated. Only 4 bolts required for attachment. (There is also an immersed type of the newer design.)



Gusher Pumps Patented and Patents Pending.

Model 11020-A

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1821 READING ROAD

CINCINNATI 2, OHIO

The "Gusher"—A Modern Pump for Modern Machine Tools.

dislodge the Japanese after a two-year tenure and reopen the Burma Road land supply channel between Free China and her United Nations' allies. Y-Force knew the need for the water line and for the incoming supply tonnage.

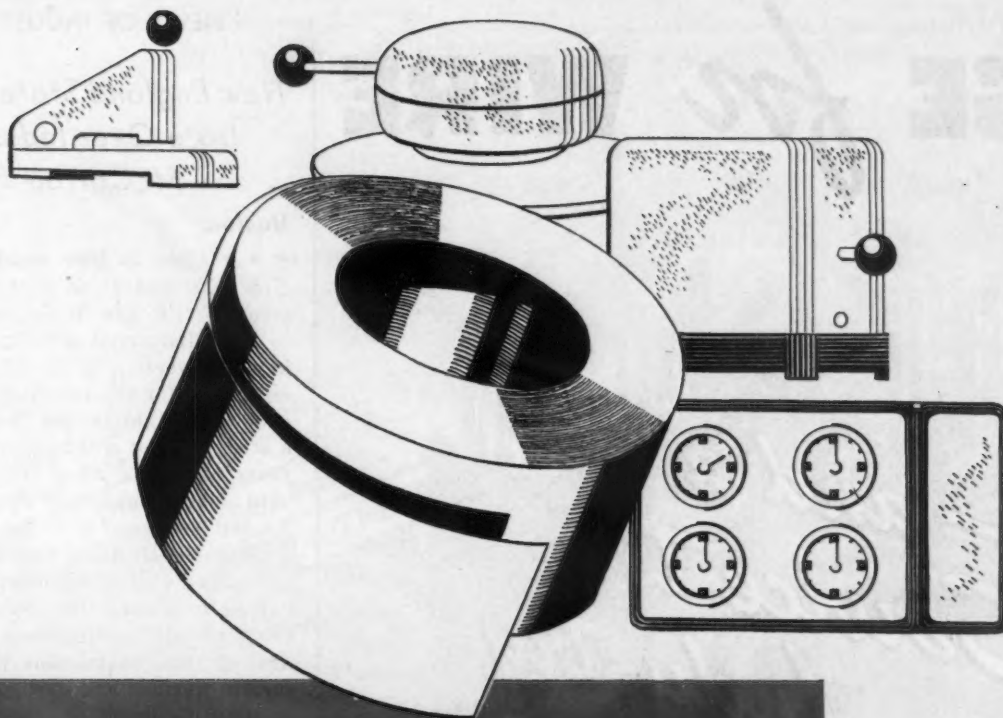
The problem was solved by a Corps of Engineers detachment as a little detail of their duty at the "end of the line," as the China-Burma-India theater of operations is called. Native wood could suffice for the water line. Material for the conduit was found growing in a wild bamboo thicket.

In a matter of hours, 600 ft. of large bamboo stems were cut, the joint piths were rammed out with a rod, connections were caulked, small holes were filled with wooden pegs and the line was complete. A continuous flow of spring water prevents cracking or further leaks in this wooden pipe line. All requirements were filled.

Army Engineer troops inspected their "pipe," joined and caulked the bamboo stems, fashioned bamboo trestles to support the line across defiles and suspend it over jagged rocks, and finally saw water flow from the mountain spring to their mess hall. They did all this with as much enthusiasm in their mental and physical handiwork as did any of the workers on the "Big Inch" oil line from Texas to the Atlantic Coast. GI Joe names most things, and this little 600 ft. job is proudly called the "Bamboo Inch."

Improvising is not the unusual, but the common practice by U. S. personnel in China. This saving of a quarter-ton of metal pipe by substituting native wood is a fair example. The one small job did not do five things: 1, require metal for 678 lb. of pipe; 2, take machinery from more vital work; 3, displace indispensable cargo for a 17,000-mile ride from America to India; 4, displace more urgently needed tonnage on the U. S. Army-operated Bengal & Assam Railway from Calcutta to northeast India; nor 5, take space on the freight planes which fly the Himalaya Mountains "Hump" to maintain the only major supply link between military stockpiles in the Assam Province of India and Free China.

Such handicraft as the "Bamboo Inch" water line are not part of the Engineer Corps' standard training in basic camps at home, but they accomplish the mission in the field, get the desired job done promptly, and make fewer calls on the home front, which is a long way from the battle front in southwest China.



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Follansbee's experience in making special, high quality steels presents advantages to the buyer of such a staple item as Cold Rolled Strip Steel.

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are being planned, or when difficulties are experienced in your present stamping or drawing operations.

And when you require extraordinary service, Follansbee's compact and flexible organization can frequently be of help.

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BRIDGEPORT • CONNECTICUT

NEWS OF INDUSTRY

New England States Irate Over Industrial McCarran Proposal

Boston

• • • Close to 2000 members of the New England Council were warned recently that the McCarran proposal to limit industrial activity by blocking reconversion in the 11 northeastern states for the benefit of the south and west might be the “beginning of a struggle that will last three or four years after the war.”

In a communication, New England Council Treasurer E. C. Johnson, president of the H. A. Johnson Co. of Boston, urged Council members, business associations, and the New England Congressional delegation to unite against “the outrageous proposal of certain western and southern senators to limit reconversion.”

Mr. Johnson declared the movement had “stirred New Englanders deeply” and that every New England group, including agriculture, should register active opposition against the proposal by contacting its own representatives in Congress.

“Farm organizations also should take action,” said he. “It is industry that provides the greater part of the market for New England farm products. Any artificial check on the expansion of industrial activity in this region will react adversely upon the farmer.”

“While Maine, New Hampshire and Vermont are not included in the 11 states named by the Senators, there is every reason to believe that the people of those states fully share the feelings of Massachusetts, Rhode Island and Connecticut, and that their Senators and Representatives, if asked to do so, will gladly join their colleagues to give New England a united front in Washington.”

The McCarran proposal has demonstrated the growing necessity for regional unity and cooperation within New England, not only for its own advancement, but for aggressive defense against the attempts of political spokesmen for other regions to use the powers of government in furtherance of unfair competition against New England and the industrial northeast, Johnson declared.

Warning that the New England Congressional delegation must be on the alert in the next few months to combat any predicted moves by the South and West to gain local possession of government-owned war plants on other than a sound business

CENTERING
DRILLING
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THREADING
TAPPING
SLOTTING
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COUNTERBORING
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with
Wickman
SWISS TYPE
AUTOMATICS
and their various
attachments
In addition to normal turn-
ing and forming operations

The No. 2 Wickman machine illustrated is equipped with both three-spindle and slotting attachments. Three other attachments for drilling, threading and taper turning are also supplied for this machine. All Wickman attachments are easily interchangeable.

Do you manufacture parts which are in any way similar to those illustrated above—which require any of the operations listed? Are you interested in holding production runs of those parts to tolerances of $\pm .0005''$ or closer and securing finishes as fine as 25 micro-inches? If your answers to these two questions are in the

affirmative, Wickman Swiss Type Automatics have a place in your production.

Two Swiss Type Automatics are produced by Wickman. The No. 2 machine shown above has a $\frac{1}{2}''$ bar capacity and will handle pieces up to 4" long. The No. 1 machine has $\frac{5}{32}''$ bar capacity, maximum length capacity of $1 \frac{9}{16}''$.

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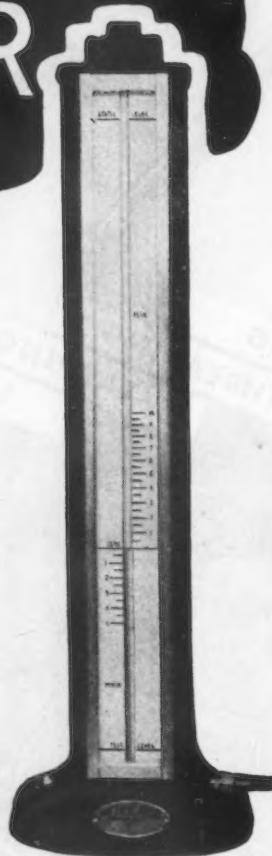
of
INTERNAL DIAMETERS

EXTERNAL DIAMETERS

TAPER AND STRAIGHTNESS

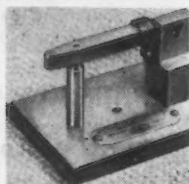
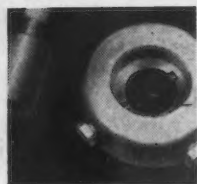
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All METRICATOR gages are custom-built—engineered to meet your specific needs, assuring you of greater adaptability and guaranteeing precision accuracy.

METRICATOR gages eliminate human element variations and maintain their high degree of accuracy for a longer period of time in spite of wear.



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IN YOUR OWN PLANT . . . SOLVING
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basis, Johnson repeated the recommendations made last August by the Research committee of the Committee for Economic Development, headed by Ralph Flanders, president of the Federal Reserve Bank of Boston and former Council president.

"A serious danger is likely to arise in connection with the efforts of communities or regions to continue uneconomic facilities in operation by means of governmental subsidies in order to maintain war-swollen populations. The subsidizing of sub-marginal plants tends to throw the affected industry out of balance and to discourage forward planning. It should therefore be the general policy to avoid such subsidies."

Postwar Farm Plans Initiated by Rutgers New Brunswick, N. J.

• • • Initiation of a program designed to give farmers the benefits of modern improvements in building techniques, materials and design was announced recently by Dr. William H. Martin, dean and director of the New Jersey College of Agriculture and Experiment Station, Rutgers University.

The program, embracing all parts of the country east of the Rocky Mountains, was made possible by a grant from the John B. Pierce Foundation of New York. As the first step, Rutgers is organizing a national council to plan and guide a comprehensive study of farm building design.

"One of the most pressing needs of post-war agriculture is the modernization of buildings," Dr. Martin said in announcing the project. "For many years farm buildings have been depreciating at an annual rate exceeding replacements by many millions of dollars. In addition, many buildings that are in relatively good physical condition are not so designed to render efficiently the service for which they were intended.

"By scientific analysis of the functions which a given farm building is to perform and by greater standardization of design," Dr. Martin pointed out, "we hope to pave the way for the application in agriculture of the improvements and economies that are in store for the prospective home

WPB to Retain Controls

• • • WPB will retain controls over the following items after X-Day: electric motors, valves, anti-friction bearings, and tools. The General Scheduling Order, M-293, will also be retained.

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Because Detrex engineers are thoroughly familiar with the capabilities and limitations, as well as war and postwar uses of present metal cleaning equipment, they are in a position to offer many helpful suggestions to plant committees working on reconversion programs. These services are available to you at any time . . . no obligation, of course.



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NEWS OF INDUSTRY

Robot Bomb Design Reveals Simplicity And High Efficiency

New York

• • • A recent account in the London *Daily Times* describing further details of the now notorious robot bombs highlights the control system, originally thought to be a radio remote control system, but now known to be otherwise. According to the *Times*, the pilotless airplane is controlled by a windmill of small size in its nose.

The revolutions of the windmill are recorded by an electrical counter, operated from a contact on the windmill shaft, set in such a way that when the bomb has traveled a specific distance, it noses over into a steep dive. This directional change is effected by locking the controls and lowering small flaps under the tail.

Among other interesting facts disclosed by the *Times* is the fact that the warning which the "buzz-bomb" gives that it has gone into its dive and is ready to strike is purely accidental, from a design standpoint. The arrangement is such that when the controls are locked and the flaps go down, the change in flight attitude tilts the fuel chamber so that it stops feeding into the engine, and the engine stops. It is the abatement of the engine noise that has served warning to Englishmen this summer that more destruction is headed their way.

Additional information as to the extreme simplicity of the design, coupled with the gradual trickling out of information on the tremendous damage done by V-1 lend credence to the often heard report that this weapon has been selected for a major share in our future attacks on the Island Empire of Japan. Capture of island strongholds on the inner perimeter of Japan's defenses is almost certain to be effected before the final assault on the mainland is attempted. These islands would make ideal launching centers for pilotless aircraft with their tremendous load of high explosive, and it would seem that the densely populated islands would be perfect targets.

The only serious disadvantage to the robot bomb in the form in which it is being used today is its high fuel consumption, probably a critical problem from the German standpoint. However, even with its known limitations the apparent value of the weapon would make it seem worthwhile even assuming that our aeronautical

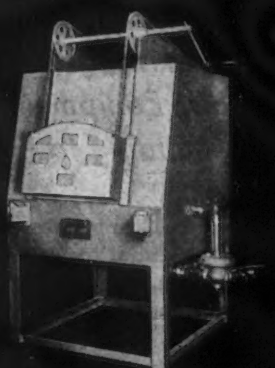


STEWART

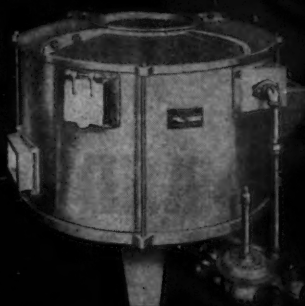
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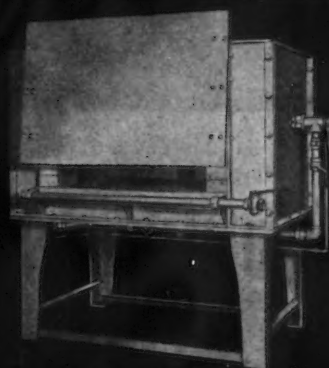
In addition to large units designed to meet specific production requirements, STEWART also builds these famous
STANDARD INDUSTRIAL FURNACES



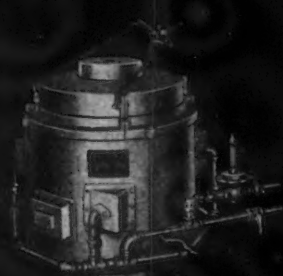
SEMI-MUFFLE OVEN FURNACE



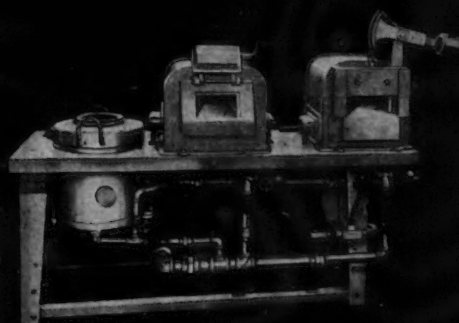
ROUND POT FURNACE



OPEN SLOT FORGE



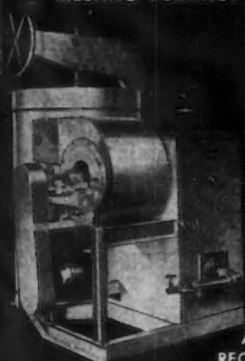
STATIONARY METAL
MELTING FURNACE



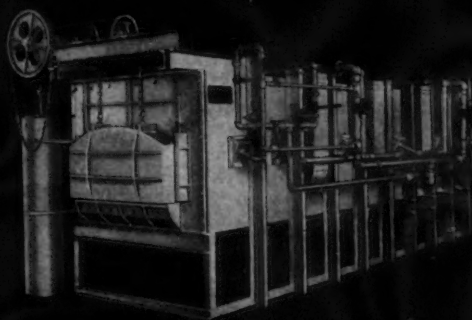
TRIPLE PURPOSE COMBINATION



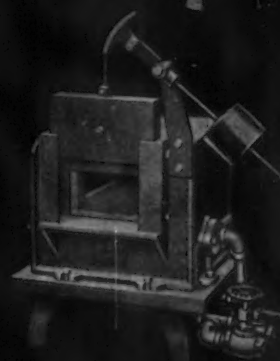
SMALL
FORGE



AIR DRAW
RECIRCULATING
FURNACE



HEAVY PORTABLE OVEN FURNACE



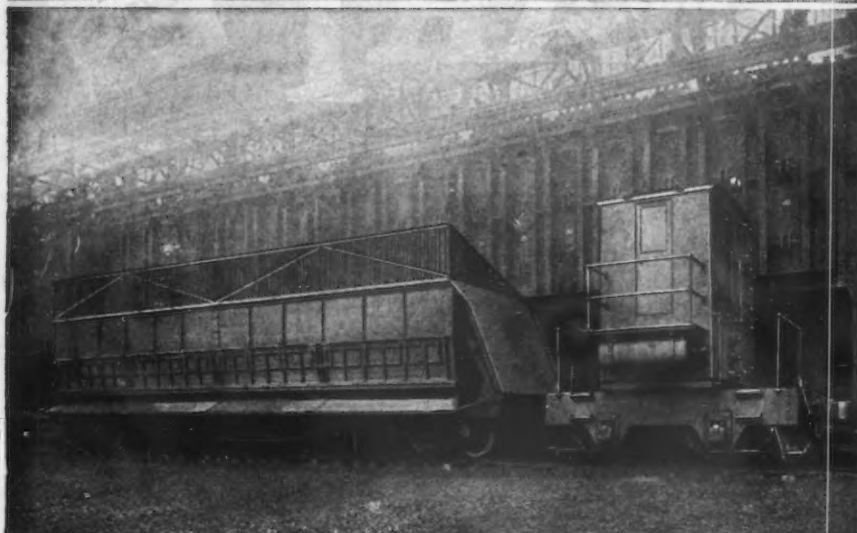
BENCH OVEN FURNACE

A letter, wire or 'phone call' will promptly bring you information and details on STEWART Furnaces.
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NEWS OF INDUSTRY

and ordnance engineers could not improve on existing German models.

If the research which was started by our Army during the past war has met with any considerable degree of success in this line, we may assume that our uses may be even more devastating than the Germans, and that it will be a part of the carefully coordinated attack on Japan. This will be its first application as an actual tactical weapon, and if well developed may take a large share of the huge softening up process which we now know must come to pass before we make any decisive amphibious assault. This would relieve our carrier based planes and long range bombers from some of the risky jobs on Japan.

Shortages Existing In Farm Equipment Building to Persist

Chicago

• • • Continued difficulty in procuring certain items essential to farm equipment manufacture, whether or not the European War ends soon, was forecast Oct. 12 by H. G. Barr, vice-president, J. I. Case Co., at the annual meeting of the Farm Equipment Institute.

Steel and malleable detachable chain, lack of which hamstrung 1944 production of certain implements, will continue to be a sore point, he predicted.

"There has been no expansion of facilities, and consequently deliveries, which have been exceedingly tight, will not materially improve. There is grave question," he said, "as to whether the steel chain industry has sufficient facilities to take care of the implement demand. Certainly it didn't have this last year, and deliveries of corn pickers to farmers are being held up now for want of chain, in spite of the fact that since January WPB has been endeavoring to assist our industry to obtain chain so that machines might be available for this season's use. Deliveries being promised at present for next year are not in line with the needs of the trade."

Sharp criticism of the government's failure to solve the castings shortage was voiced by Barr, who termed the difficulty "mostly a manpower situation." He said the situation probably would not get any worse "because frankly I don't see how it could."

"While the WPB has many accomplishments to which it can point with

LOOK TO FENN WITH CONFIDENCE

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★ SPECIAL TOOLS
★ SPECIAL PARTS

AS designers and builders of special machinery, special tools, and special parts FENN brings you the accumulated experience of *three generations* continuously engaged in precision machine shop work.

FENN will handle the entire job from blue prints straight through to the finished machine, tool, or part; or take your idea, develop it, and build a machine that will do what you expect of it.

FENN'S long experience on the shop floor and their knowledge gained in solving many difficult mechanical problems give them an individual approach to every problem. For FENN definitely expects to add that something to the finished machine that will pay dividends in faster, smoother, more dependable operation.

IT costs nothing to consult with FENN and no obligation is incurred until you are certain that they can contribute tangible, measurable value to your machinery problems. Your inquiries will have careful and prompt attention.

THE FENN MANUFACTURING COMPANY

Hartford, Connecticut

Builders of Better Machinery To Meet New Demands

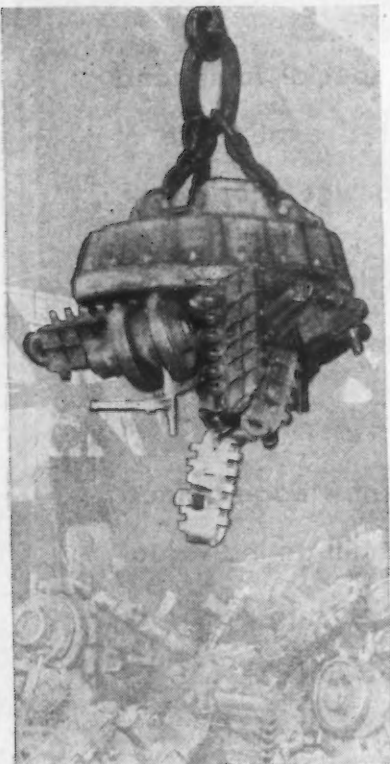
STEARNS LIFTING MAGNETS MOVE MATERIAL ECONOMICALLY

SAVE TIME — DO BETTER JOB*

"We have used a considerable number of magnets in the past 15 years, and at present have 5 of your lifting magnets in our service. These are performing excellent work, and every one of them is doing a better job of lifting than those which we had formerly used.

"As you know, these lifting magnets are used throughout our cleaning room and foundry wherever castings have to be moved and are great time savers as there is no need for chains or chainmen. A crane operator can perform the whole job of moving castings from place to place throughout the plant."

*Name on application.



You get definite saving of time and labor in moving material inside and outside of your plant with Stearns Lifting Magnets.

And they are dependable! Read what this foundry official has to say. If you want sturdy, low initial and operating cost magnets in all practicable sizes and shapes, consult Stearns Magnetic, Milwaukee 4.

Ask for our Bulletin 35.



**Separators
Drums—Pulleys
Clutches—Brakes
Magnetic Equipment**

**STEARNS
MAGNETIC MFG. CO.**

635 S. 28th Street
MILWAUKEE 4, WIS.

NEWS OF INDUSTRY

pride, the casting situation is certainly not one of them," he declared. "You would think the solution would be simple . . . but before you get into it very far you really start to find out what red tape is. You probably find out before you are through that some part of this simple problem belongs to WPB, another to WLB, another to OPA, another to WMC, another to FHA, another to the USES, another to selective service, etc. It has probably had more attention than most any item, and many, many people in government have worked on it looking toward a solution."

The forging industry also received adverse mention for "letting its costs get out of hand," and it was declared that "prices on forgings in general have been too high," principally as an indirect result of military contracts.

Principal industries supplying the farm equipment builders were placed in three categories: (1) Those industries which were bottlenecks because of large military demands, and whose facilities were built up during the war, and which will cease to be bottlenecks after V-E Day; (2) those industries which are now bottlenecks, and who had little or no military business and which will remain bottlenecks unless facilities are increased or other remedies taken; (3) those industries which will be called on for a large worldwide demand to replace that formerly taken care of by bombed out plants in Europe and which may become bottlenecks.

Steel was included in categories one and three, with mention being made of potential difficulty in securing sheets. Bolts, nuts, and rivets were named in the second group; steel roller chain, in group one; steel and malleable detachable chain, group two; lumber, group two; tires, group one and three; cotton duck, group two, and forgings, group one.

In a speech before the National Retail Farm Equipment Association, also in convention recently, George L. Gillette, vice-president of Minneapolis-Moline Power Implement Co., declared that it probably will be at least six months after V-Day before farm implements will come from the factories faster than buyers will take them from dealers.

The increased allocation of steel for civilian production in the fourth quarter may mean that lines which have not been produced during the war will be given reasonable allotments before any increase is made in the allotments of those lines that have been allowed

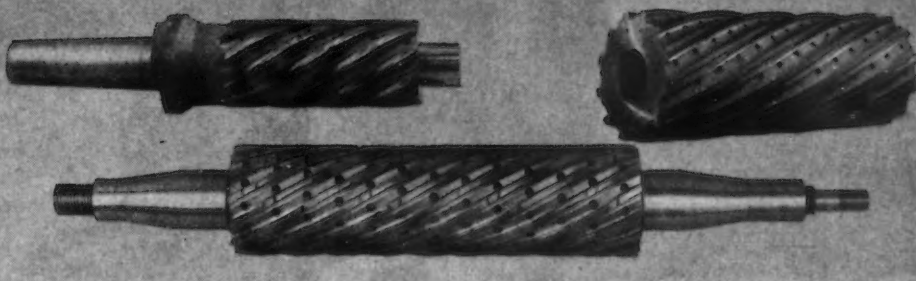
INGERSOLL

HELICAL CUTTERS

Ingersoll offers the only true inserted blade helical cutters. Blades are forged, twisted, hardened, and then ground to a true helix to accurately fit helical milled slots in the body. Cutter blade presents a constant rake angle to work, with steep helical or shearing angle, enabling cutter to mill with minimum of power. Several teeth are always in the cut. This and shearing action of helical teeth gives smooth finish at high feeds.



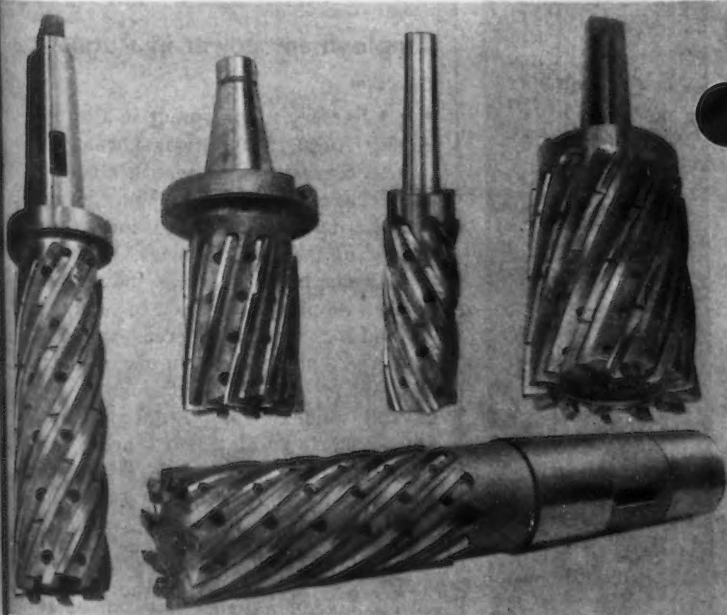
SLAB MILLING



Slab milling of wide surfaces is best performed with Ingersoll inserted helical blade cutters. These slab mills are used on the arbors of knee type machines as well as on large heavy duty Ingersoll slabbing machines as illustrated. These inserted blade slab mills are replacing many solid high speed steel types due to the economy of using renewable blades.



END MILLING



Ingersoll helical end mills are an efficient and renewable inserted blade cutter for milling wide surfaces on the periphery while end milling. Cutter furnished with slow positive helix angle for cutting on both face and periphery. When milling on periphery only, a high reversed helix angle is preferred to direct thrust back against machine spindle. Replacement blade costs are low.

Send for Engineering Specification Sheets describing complete line of Ingersoll standard inserted blade milling cutters.



THE INGERSOLL MILLING MACHINE CO., ROCKFORD, ILLINOIS

FORD TRIBLOCS

have his **QUALITIES**, too



FORD TRIBLOCS have the same two qualities as a powerful horse—strength and speed.

When high-speed production counts—**FORD TRIBLOCS** are ideal for constant hard usage. Spur gear construction, ball-bearing load wheels, both high tensile strength and elasticity in load chain, and many other features assure enduring efficiency. Capacities: $\frac{1}{4}$ to 40 tons.

FORD SCREW GEAR HOISTS are used where smoothness in lifting and lowering of loads is desirable and where portability is essential. Lightweight; highly portable. Capacities: $\frac{1}{2}$ to 10 tons.

FORD DIFFERENTIAL HOISTS are constructed for light service where speed, portability and price count. Capacities: $\frac{1}{4}$ to 2 tons.

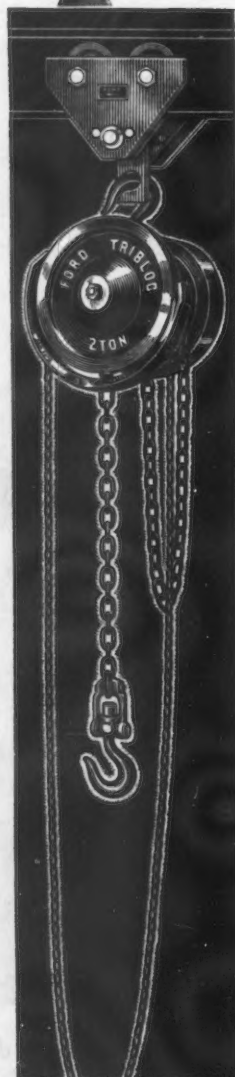
FORD HOISTS are manufactured by the Ford Chain Block Division of American Chain & Cable, Bridgeport. Offices at Philadelphia, Chicago, Denver, Los Angeles, Portland, San Francisco.



Order from Your Distributor

AMERICAN CHAIN & CABLE COMPANY, INC.

BRIDGEPORT • CONNECTICUT



NEWS OF INDUSTRY

a restricted production during the war, he said.

The dealers were warned that "added competition is in sight for the postwar period in the farm implement industry, as many manufacturers contemplate entering the field in a bigger way."

Increased production attention will be given to some such recent developments as self-propelled combines, pickup balers, green hay harvesters, hydraulically operated mounted implements, and power take-off attachments, it was predicted.

Give Acid Requirements For Iron and Steel Pickling

Washington

• • • Sulfuric acid requirements for iron and steel pickling in 1944 will be 558,400 tons and for the first half of 1945 will be 291,700 tons, according to an estimate of a WPB Chemicals Bureau representative. Total 1944 requirements, he advised members of the Inorganic Acids Industry Advisory Committee, were estimated at 10,556,200 tons against an estimated supply of 9,650,700 tons. The requirements for the first six months of next year were placed at 5,663,000 tons against an estimated supply of 5,251,000 tons. The figures were presented in connection with the new Ordnance program calling for increased production of smokeless powder and TNT. WPB explained that estimates of future supplies are based on the completion of new sulfuric acid facilities.

Employment Lower in August

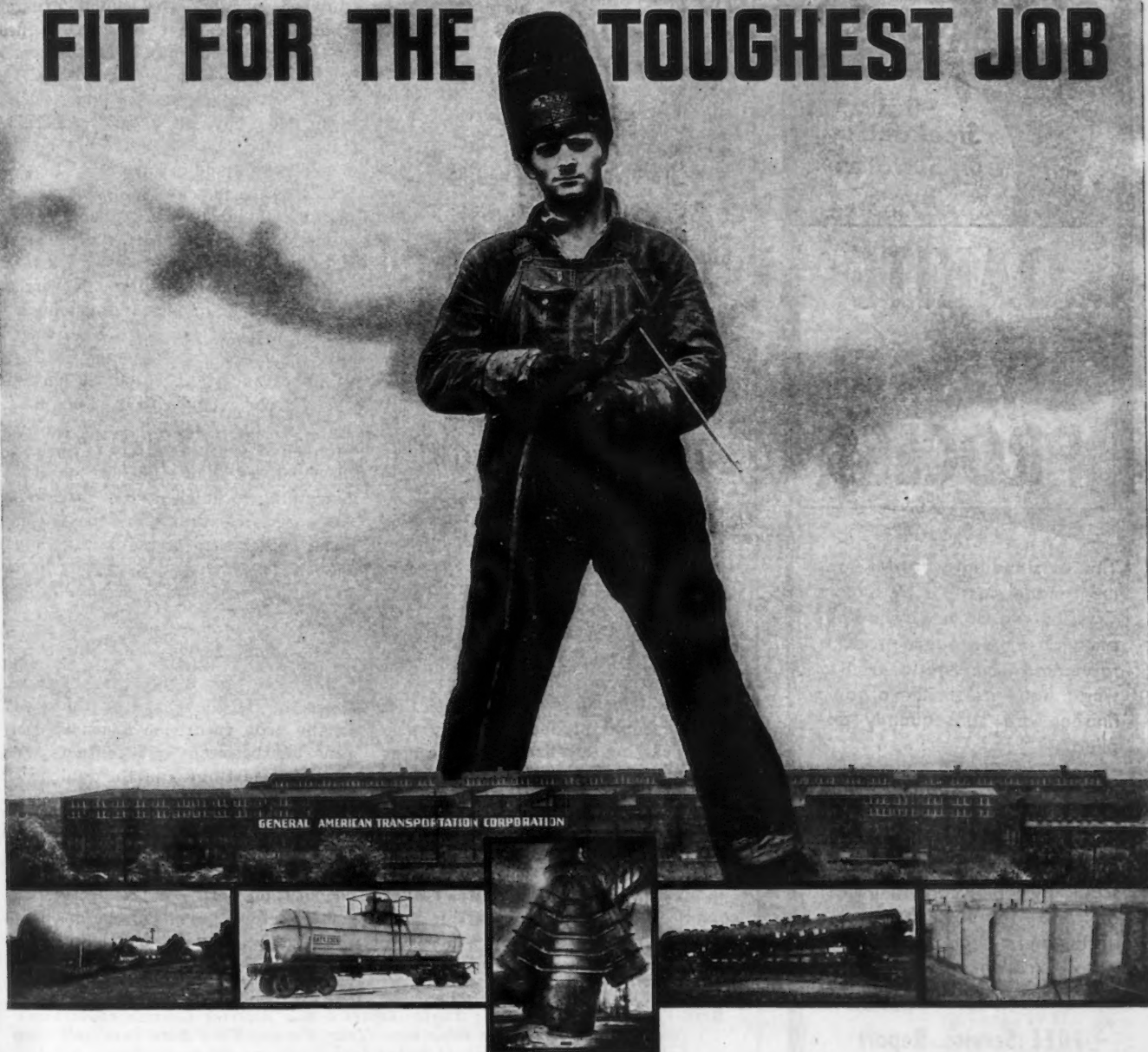
Chicago

• • • Factory employment in Chicago during August, 1944, was lower than in the corresponding month the previous year, according to the Chicago Association of Commerce index. In nearly all other categories, however, the Association's business index rose.

The employee index in August showed a four point decrease to 152.6 from the August, 1943, figure of 156.6. Despite the employment decline, the payroll index for August, 1944, gained 25.2 points over the corresponding 1943 month, the respective August index figures being 295.2 and 270.0. The increase is ascribed to higher wage rates and overtime payments.

The payroll advance was offset to some extent by the increased cost of living, which rose from 122.9 in August, 1943, to 126.3 this year.

FIT FOR THE TOUGHEST JOB



At our Sharon plant, tough jobs are tackled with enthusiasm. If GATX can be said to have a specialty, it is doing the difficult. And doing it by the well-known General American standard: EVERY piece of equipment that

leaves our plant is *better than it has to be*. Planned and built and tested to meet *more* than maximum operating demands, GATX products can mean extra safety and extra production economies in *your* plant.

GENERAL AMERICAN TRANSPORTATION CORPORATION



Plate & Welding Division

Sharon, Pennsylvania

Specialists in plate fabrication—manufacturers of pressure vessels of steel, alloys and aluminum—all classes of welding—process equipment of all types—chemical engineering laboratories and service—completely equipped field erection department.

**TENACIOUS PAINT
ADHESION ASSURED**

**on
Steel and
Iron Surfaces
by**

**OAKITE
CrysCoat
PROCESS**

This outstanding war development made possible by Oakite CrysCoat No. 86, has a wide application on peace-time products fabricated from steel or iron to which paint or similar organic finishes are subsequently applied.

In ONE low-cost, time-saving operation, Oakite CrysCoat No. 86 removes light oils, grease and shop dirt, imparts a microscopic crystalline coating to steel or iron surfaces which prevents rusting and at the same time provides excellent, firm grippage for paint.

FREE Service Report Gives You All Details

Safe to product and the equipment in which it is used, Oakite CrysCoat No. 86 is economical to use, speeds production, eliminates paint adhesion failure due to incorrect surface preparation. Write for FREE Service Report giving essential details.

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Technical Service Representatives Located in All
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OAKITE *Specialized cleaning*
MATERIALS & METHODS FOR EVERY CLEANING REQUIREMENT

NEWS OF INDUSTRY

Industrial Precision Castings

(Continued from Page 82)

different design in order to get greater efficiency, either in production or in use.

Turbo Vane Application

For example; an engineer in designing a turbine may specify a vane with a thickness of 0.050 in. on the exit side. He may do that because he does not consider it practical to machine a vane of 0.020 in. on the exit side, although in a number of applications the 0.020 in. exit edge is decidedly the more desirable and definitely is strong enough when the proper alloy is used. It may be desirable in designing this vane to specify an alloy that could not be machined at all, as for example, one of the Stellite alloys capable of use at high temperatures and possessing sufficient strength, elongation and resistance to shock and fatigue. Or it may be desirable to use one of the 12 per cent chrome steel alloys. Many new designs of blades would never have been made, except for the fact that we could produce them by precision casting. When these designs are put into use, they give a vastly superior performance.

There have been many instances of assemblies that were made up of three, four, five or even more parts, the finished shape of which was rather complicated and could only be machined with great difficulty. Also, be-

cause of the method of assembly, the finished weight was much greater than desirable. We have redesigned many such pieces into a precision casting that is lighter in weight, is stronger, and is made from a more desirable alloy, all at a considerable saving in cost.

We have made precision castings as small as $\frac{1}{8}$ in. cube and as large as 10 lb. Obviously, we cannot hold the same tolerances and produce the same details in the large casting that we can in the small casting. Nevertheless by proper understanding of what can be obtained we are able to design into the large piece so many features of importance that we obtain an article of great superiority over one made by any other method. There are a number of surfaces in the large piece on which we allow sufficient metal for machining to finished size. But in all cases, the machining is done on surfaces geometrical or regular in shape, and as often as not, they can be ground to size if they cannot be cut to size.

Choice of Alloy and Shape

Because of all of these factors, there has in the past and there will in the near future be a considerable time lag between first contacts with precision castings and the realization of designs applicable to particular products. It will be necessary for the producer of precision castings to do a really scientific job of engineering in cooperation with the prospective customer before parts can be produced that will be of value to industry. This

ROBOT BOMB CAVERN: Yanks inspect a now deserted German robot bomb factory in a former ore mine near Metz, France. They have been told that before its capture on Sept. 11, it had been producing 100 to 150 bombs per day.



This pair of Macwhyte Type No. 1 ATLAS Braided Slings on a straight pull has a combined strength of 470.4 tons! When used in a basket hitch their combined strength is 665.2 tons and used with a safety factor of 5, they handle 133.04 tons easily and safely.

**For
handling
Tons or
Pounds!**

MACWHYTE ATLAS Braided SLINGS

*There is a size and length to
meet your requirements*

EASY TO HANDLE... because they are made from right and left lay ropes, they are flexible, do not twist and are light for their great strength.

SAFE... because they are made from the highest quality rope, properly designed and made by skilled craftsmen. As a connecting link between crane and load or as a means of gripping the load, there is no better sling made than the patented Macwhyte ATLAS Braided Sling.

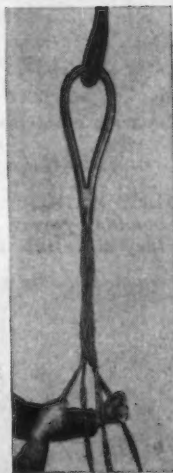
Each sling is composed of two endless pieces of Monarch Whyte Strand wire rope, one right lay and one left lay, which are folded to provide two (or more) right lay and left lay members. These members are then spirally braided so that each endless rope runs the entire length of the sling body at least four times, regardless of the sling length or number of parts.

Numerous designs, strengths, and lengths are made

When the maximum load to be handled is determined, over-size, needless weight and bulk is not necessary when you specify patented Macwhyte ATLAS Braided Slings.

Send your handling problems to Macwhyte Sling Engineers. They will recommend slings that inspire confidence in your workmen, and relieve you of handling worries.

Ask for our new Sling Catalog, S-7. A request on your company letterhead will bring it promptly.



Notice the uniform spiral braiding in an ATLAS Sling. In the 8-part ATLAS body, there are 2 pairs of left lay endless ropes, and 2 pairs of right lay endless ropes. There is no finer lifting element for maximum safety, minimum weight, and easy handling.



One order of Macwhyte Type No. 5 ATLAS Braided Slings equipped with Crescent thimbles. These slings are lightweight, flexible, easy to handle, and safe!



Member National
Safety Council



MACWHYTE COMPANY

2911 FOURTEENTH AVENUE, KENOSHA, WISCONSIN

Manufacturers of the **CORRECT** wire rope for your equipment

Left-&-Right Lay Braided Slings • Aircraft Tie-Rods
Aircraft Cable • "Safe-Lock" Swaged Terminals

Mill Depots: New York • Pittsburgh • Chicago • Ft. Worth • Portland
Seattle • San Francisco • Distributors throughout the U.S.A.

Manufactured under U.S. and Foreign patents

★ *Speed the Victory with more War Bonds!* ★

NO. 799-8

MACWHYTE SLINGS FOR INDUSTRY

"Lifting safety to new heights"

Macwhyte ATLAS Braided Wire Rope Slings are made to meet the capacity of any crane built



it's in the bag!

• Ever since Pearl Harbor Holly springs have seen distinguished service on every battle front. Usually invisible, their outstanding achievement is their consistent, trouble-free performance. In their own inconspicuous way they, too, have helped put Hitler in the bag.

Today Holly's precision workmanship is pointed toward a more normal endeavor. Just as in our all-out war effort you will find that Holly ingenuity and advanced designing can help you win the peace. We invite your inquiries.

Phone Holly 2211 or
from Detroit, dial Cherry 4419.



job of engineering can be done only on the basis of factual knowledge and experience. We know the facts from the experience gained in the production of more than 400 different parts in more than 35 different alloys, totaling more than 4,000,000 pieces made in the past two years. We have learned a great deal not only about the proper handling of metals, the proper gating, spruing, etc., and all the other factors that enter into production, but also about the construction of molds. As a result of this experience, we know what can ultimately be produced.

The work done in precision casting has caught the fancy and imagination of those engineers who are familiar with it. They realize, as stated above, that they can design for greater efficiency in operation and for longer wear where superior alloys can be used. We are trying to impress upon the minds of engineers the fact that they can design in terms of the most desirable in alloys and in shapes rather than to design in view of what is available by old methods of production.

We have not discussed the matter of price comparisons with other methods of production because price is an item that does not have any meaning unless it is correlated with other information related to machining and other operations omitted. The fact that precision casting is a practical means of discussion is definitely established. From here on the progress will be with considerable speed.

Baldwin Locomotive Construction on A Subcontract Basis

Philadelphia

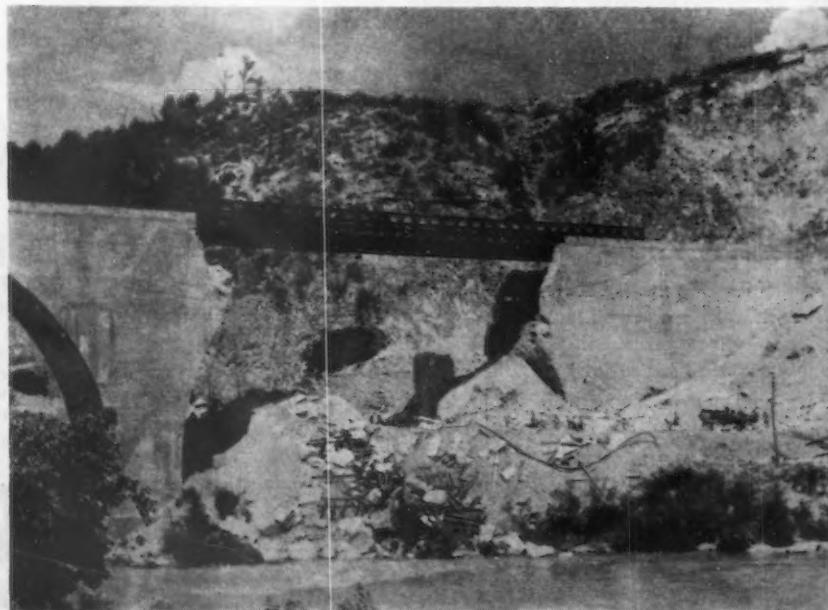
• • • In its program of building work-type locomotives for the Government, the Baldwin Works is writing a new page in its production history. It is letting out, to a large number of subcontractors, orders for parts of the engines. In so doing many of the firms are producing materials they never made before, according to Ralph Kelly, president of Baldwin.

The Government order for locomotives, is being spread out among several hundred firms to aid small business in many areas and so spread employment.

In some cases, Mr. Kelly said, the sub-contractors will be making equipment and using methods along their own line of manufacture, but in some outstanding cases the contracts call for a radical departure from previous products.

Different from the locomotives ordinarily built for American railroads, the engines are so simple in their exterior aspects that the British have named them "Austerity" models. There are no frills, no decorative touches, no bright work. They are the Baldwin locomotive simplified to the nth degree and are destined for work on railroads wherever war traffic must be carried—Europe, Russia, Iran—anywhere needed.

BAILEY BRIDGE: A missing arch in this stone bridge in Italy, victim of allied bombing planes, is replaced by a span of Bailey Bridge by our engineers as they move into territory formerly occupied by the enemy.



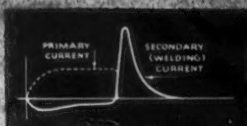
RESISTANCE WELDING

firsts BY

$$H = I^2 R T K$$

SCI AKY

first WITH STORED ENERGY



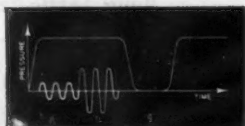
First introduced in 1939 . . . Sciaky electro-magnetic Stored Energy principle found immediate acceptance in the aircraft industry. Special Preheating current, together with the Dynatrol arcless current interrupter are employed . . . the most efficient process for welding light alloys.

first WITH VARIABLE PRESSURE



An automatic pressure cycle essential for heavier gauges of aluminum . . . metal is precompressed, then pressure reduced during weld, followed by forging pressure after the passage of current . . . accounts for metallurgically sound welds. Cycle also used for forging on a.c. machines for steel.

first TO WELD SCALY STEEL



An exclusive Sciaky process for the welding of sally and rusty steels . . . produces welds equal in consistency, uniformity and structure to those usually produced on clean pickled steels. Results in excellent tip life . . . permits comparatively rapid welding times for heavy stock.

first WITH "3 PHASE- SINGLE PHASE" BALANCED POWER



This revolutionary achievement in power efficiency utilizes all three phases of the supply . . . results in perfectly balanced load at near unity power factor, and decreased actual power demand. Reduces power installation and operating costs . . . provides ideal welding current for heavy gauges of steel.

RESISTANCE WELDING . . . the fusion of metals by resistance to the passage of an electrical current . . . has come a long way since Professor Elihu Thompson patented the first spot welder in 1886. Since then design and performance have been steadily improved, and particularly in the past five years, developments have encouraged recognition of resistance welding as a major fabricating tool. *Sciaky has made notable contributions to this development.* Through constant research . . . refinements of weld quality, machine design and power efficiency have brought about wide acceptance of Sciaky welders. Consult us on your resistance welding problem.

SCI AKY BROS.

4915 West 67th Street, Chicago 38, Illinois

Offices in Los Angeles, Detroit, Cleveland and Washington

Representatives in Principal Cities

In England: Sciaky Electric Welding Machines, Ltd., London

MACHINE TOOLS

... News and Market Activities

WPB Tightens Rating Policy On Machine Tools Costing Over \$500

Washington

• • • Effective Oct. 19, WPB has further tightened the rating policy on machine tools costing more than \$500, but made no change in the rating policy affecting machine tools costing less than that amount.

An amendment to Order E-1-b provides that ratings for machine tools costing more than \$500 will be assigned only if the tools are required for military purposes, or are needed urgently for purposes related to the war effort. This clarification gives effect to WPB's earlier statement that a minimum of ratings will be assigned to non-military orders for machine tools.

WPB's rating policy on equipment required for reconversion was tightened on Oct. 13, by an amendment to Priorities Regulation 24. This provided that ratings will be assigned only in those exceptional cases where a critical bottleneck exists in the availability of a few key items of machinery or equipment, or where an extremely urgent need for such equipment has been established.

Under the latest amendment to E-1-b, non-military purchasers will be

required to place unrated purchase orders. They must furnish proof that adequate delivery dates cannot be obtained on that basis before any WPB consideration will be given to the assignment of a rating for the tools desired. Full justification must be given for delivery dates requested by consumers in advance of dates that can be promised by producers on unrated orders, WPB said.

13,000 Civilians Conduct Air Forces Materiel Inspection

Dayton

• • • There are over 13,000 Army Air Forces inspectors in the aircraft plants where the 450,000 separate items of AAF equipment are manufactured, responsible for the quality of the many component parts which go to make up the materiel of the AAF.

Inspection is a huge job—and one of the difficult aspects of the task is setting up procedures and maintaining the highest possible quality of

equipment used in the work.

Here at headquarters of the Air Technical Service Command is an organization, with equipment valued at over a half-million dollars, for the purpose of insuring proper standards of inspection. The miscellaneous equipment laboratory branch headed by Capt. G. F. Hoover, has the world's finest and most accurate equipment in the tool and gage and instrument laboratories.

The instrument laboratory's primary job is to insure the procurement of instruments with a high degree of accuracy under all conditions. Constant check is kept on the 125 different types of instruments subject to AAF inspection. There are barometers which can be read to .0039 of an inch, potentiometers which are accurate to one-millionth of a volt, resistance thermometers which will consistently check to within one one-thousandth of a degree. There are also vacuum chambers and cold chambers which simulate conditions of flight at varying altitudes and temperatures. Every effort is made by this laboratory to see to it that our great air force has the best possible instruments.

In the Tool and Gage Laboratory every conceivable type of master gage, machine tool, optical equipment, profile template and other inspection device is kept on hand to insure the greatest of accuracy.

These techniques allow rapid inspection of the finished product and, through accuracy, the interchangeability of aircraft parts on the far-flung battle fronts.

Machine Tool Business Fair

Cincinnati

• • • District machine tool builders continue to report fair business but expect to gain much from the convention during the week at White Sulphur Springs. Surveys and comments on postwar business engaged attention but reactions are as numerous as there are readers of the surveys. Generally, however, a greater number of manufacturers appear to hold an optimistic opinion of postwar markets than pessimistic. Some orders for postwar are coming in but these are being held until government controls clear.

HEAT ON GERMANY: A Yank tank demonstrates its flame throwing ability a few miles from Germany on the Western Front. It will be used against the fortifications of the Westwall.



LOOK! NEW LOW PRICES ON **SUPER** SHELL END AND FACE MILLS!

It's true! Down go prices on SUPER Shell End and Face Mills! Ever increasing orders from users, improved manufacturing techniques, increased production facilities, engineering research and development . . . these are reasons why the new low prices shown below are possible.

If you have been using SUPER Shell End and Face Mills you know of the production economies resulting from the faster cutting and the cleaner cutting that these tools produce. You know, too, of the finer finishes, the greater accuracy and the longer tool life with these cutters on the job.

Now add to these economies the savings you get from these new low prices and you'll agree . . . SUPER Milling Cutters are *real* MONEY SAVERS!

PRICE LIST

SIZE	FOR GENERAL USE		FOR STEEL		NEW PRICE EACH
	No. of Teeth	Stock Number	No. of Teeth	Stock Number	
SHELL END MILLS					
1¼"	4	GSM-1	6	SSM-1	\$17.00
1½"	4	GSM-2	6	SSM-2	18.00
1¾"	4	GSM-3	6	SSM-3	19.00
2"	4	GSM-4	6	SSM-4	19.50
2¼"	6	GSM-5	6	SSM-5	20.00
2½"	6	GSM-6	6	SSM-6	20.50
2¾"	6	GSM-7	6	SSM-7	21.50
3"	6	GSM-8	6	SSM-8	22.50
3½"	6	GSM-9	6	SSM-9	25.00
4"	6	GSM-10	6	SSM-10	27.50
4½"	6	GSM-11	6	SSM-11	32.00
5"	6	GSM-12	8	SSM-12	35.00
5½"	6	GSM-13	8	SSM-13	37.00
6"	6	GSM-14	8	SSM-14	40.00
FACE MILLS					
8"	8	GFAC-8	10	SFAC-8	60.00
10"	8	GFAC-10	12	SFAC-10	75.00

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Rd., Detroit 13, Mich. 4105 San Fernando Rd., Glendale 4, Cal.

NON-FERROUS METALS

... News and Market Activities

Increase Uses of Copper and Brass

• • • WPB has embarked on a series of amendments to conservation orders for copper and copper base alloys in which they are made available for specified civilian uses. Recently the basic copper control measure, M-9-c, was relaxed sufficiently to permit a number of essential civilian applications. Larger amounts of copper for plumbing, and removal of restrictions on the use of aluminum, lead and zinc, are permitted by amendment to Sched-

Co. stockpile in short tons at the end of the following months:

January	254,500
February	286,900
March	301,200
April	284,800
May	276,900
June	278,700
July	273,400
August	305,500

It has been reported that the premium price plan has been under study by a committee of several government

remain at ceilings. On the other hand brass mill scrap purchases have been somewhat below ceilings for the past month except where reciprocity is involved.

Indium

• • • The price of Indium has dropped to \$4.50 per troy ounce, and ample supplies are available. This compares with a price a year ago of \$10.00. This metal is used in minute quantities as a constituent of bearing alloys.

Lead

• • • Lead consumption continues high and stocks are being reduced at a steady rate. Lead producers scout the contention that more stringent government controls may possibly be applied to civilian applications for lead. It is the contention of leaders of the industry that it would be to the country's advantage to drop the premium payment plan with respect to lead, despite its shortage, and import it in larger quantities to supply the demand. Present policies serve merely to depreciate our resources of the richest lead deposits at an accelerated rate.

Copper Production and Consumption in Thousands of Short Tons

Source: American Bureau of Metal Statistics

	1944 Jan.-June	Average per month	1944 July	1944 Aug.
Total supply of refined copper	902.8	150.5	138.2	155.6
U. S. mine production	528.9	88.1	75.9	74.7
Difference	373.9	62.4	62.3	80.9
Deliveries to:				
Copper and brass mills	569.9	95.0	71.9	87.9
Wire and cable mills	229.1	38.2	35.3	42.3
Foundries	51.5	8.6	7.3	7.6
Uncontrolled (non-C.M.P.)	38.0	6.3	4.5	2.7
Total	888.5	148.1	119.0	140.5
Shipments in ingot brass (Est. copper content)	215.4	35.9	33.4	33.8

ule 12 of Plumbing and Heating Order L-32. Brass plating can now be done on specified builders' finishing hardware under amendment to order L-236. Increased quantities of copper are now permitted to be used by electrotypers for the production of printing plates under amendment to order M-339.

It is apparent that the supply of refined copper is more than sufficient to accommodate all war requirements and that WPB is gradually releasing supplies for civilian needs. Copper producers report that there is neither surplus nor shortage of copper for authorized uses. Total domestic production, as increased by operation of the premium price plan, is being taken by brass and wire mills, foundries and ingot producers. While imports also go to these mills and foundries, there is a gradually increasing reserve in government hands. These refined copper supplies were in Metals Reserve

agencies. No decision has yet been announced.

Copper producers report that commitments for November delivery are not being received as early as customary in previous months. In copper this condition is not as pronounced as in zinc where fabricators are apparently hoping for a drop in price and so are depleting their inventories to the point at which producers have not always been able to meet requests for immediate or short term delivery. It is the opinion of some copper producers that relatively small November commitments reflect the desire of mills to reduce their inventories in order to liquefy their assets at the year end. Should this not be the case, however, a flood of incoming orders might serve to disrupt orderly deliveries and perhaps result in delays in war production.

Ingot producers report that copper scrap supplies are easy but that prices

British Now Seeking International Pacts For Zinc and Copper

Washington

• • • British commercial officials are now trying to secure international agreements between the United States and English firms on two commodities—zinc and copper, State Department officials say.

At the same time, these same British officials are shying away from conversations American officials are pushing on tin and industrial diamonds, it is reported.

The Interdepartmental Cartel Committee composed of officials from Federal Trade Commission, the State and Commerce Departments has reported that no American companies shall be permitted to enter into cartel agreements on a prewar basis, but that all such agreements shall be governmentally approved, before they are legal.

NON-FERROUS METALS PRICES

Primary Metals

(Cents per lb. unless otherwise noted)

Aluminum, 99+%, del'd. (Min. 10,000 lb.)	15.00
Antimony, American, Laredo, Tex. 14.50	
Beryllium copper, 3.75-4.25% Be; dollars per lb. contained Be	\$17.00
Cadmium, del'd.	90.00
Cobalt, 97-99% (per lb.)	\$1.50 to \$1.57
Copper, electro. Conn. valley	12.00
Copper, electro. New York	11.75
Copper, lake	12.00
Gold, U. S. Treas., dollars per oz.	\$35.00
Indium, 99.5%, dollars per troy oz.	\$45.00
Iridium, dollars per troy oz.	\$165.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9+%, carlots	20.50
Magnesium, 12-in. sticks, carlots	27.50
Mercury, dollars per 76-lb. flask, f.o.b. New York	\$108 to \$110.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	\$24.00
Platinum, dollars per oz.	\$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.67

Remelted Metals

(Cents per lb. unless otherwise noted)

Aluminum, No. 12 Fdy. (No. 2)	8.50 to 9.00
Aluminum, deoxidizing	
Nos. 2, 3, 4	6.25 to 9.00
Brass Ingot	
85-5-5-5 (No. 115)	13.25
88-10-2 (No. 215)	16.75
80-10-10 (No. 305)	16.00
No. 1 Yellow (No. 405)	10.25

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.87	20.37	
Copper, H.R.		17.37	
Copper drawn		18.37	
Low brass, 80%		20.40	20.15
High brass			19.48
Red brass, 85%		20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut		15.01	
Commercial bronze, 90%		21.32	21.07
Commercial bronze, 95%		21.53	21.28
Manganese bronze	24.00		28.00
Phos. bronze, A, B, 5%		36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculey, Olympic or equal		25.50	26.00
Nickel silver, 5%		28.75	26.50
Architect bronze	19.12		

Aluminum

(Cents per lb., subject to extras on page, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier: 2S and 3S, 22.7c. a lb.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness: 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 25½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price: 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals: ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 24c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in.,

23c. 24ST, rectangles and squares, random or standard lengths, 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

NON-FERROUS SCRAP METAL QUOTATIONS

†(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)

Copper, Copper Base Alloys

OPA Group 1†

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2†

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.50
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25
Automobile radiators	7.00
Zincy bronze borings	8.00
Zincy bronze solids	8.00

OPA Group 3†

Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.25†
Manganese bronze solids	6.25†
Manganese bronze borings	6.50†
Manganese bronze borings	5.50†

OPA Group 4†

Refinery brass	4.75*
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*Price varies with analysis. †Lead content 0.00 to 0.40 per cent. ‡Lead content 0.41 to 1.00 per cent.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

Other Copper Alloys†

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.875
Loose Yellow Brass Trimmings	7.875

Aluminum

Plant scrap, segregated

2s solids	7.50
Dural alloys, solids 14, 17, 18, 24S	2.50
25S	3.00
turnings, dry basis	2.00
Low copper alloys 51, 52, 61, 63S	5.00
solids	3.00
turnings, dry basis	3.00

Plant scrap, mixed

Solids	2.00
Turnings, dry basis	1.50

Obsolete scrap

Pure cable	7.50
Old sheet and utensils	4.00
Old castings and forgings	3.25
Pistons, free of struts	3.00
Pistons, with struts	1.50
Old alloy sheet	3.00

Magnesium

Segregated plant scrap

Pure solids and all other solids, exempt Borings and turnings	1.50
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Mixed, contaminated plant scrap

Grade 1 solids	3.00
Grade 1 borings and turnings	2.00
Grade 2 solids	2.00
Grade 2 borings and turnings	1.00

Zinc

New zinc clippings, trimmings	6.00
Engravers, lithographers plates	6.00
Old zinc scrap	4.75
Unsweetened zinc dross	5.00
Die cast slab	4.50
New die cast scrap	4.45
Radiator grilles, old and new	3.50
Old die cast scrap	3.00

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead inc. cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%. Cu under ¼%, 26c. per lb.; 90 to 98% Ni, 26c. per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point)

Copper: Cast, elliptical, 15 in. and longer	25½
Electrolytic, full size	22½
cut to size	30½
Rolled, oval, straight, 15 in. and longer	23½
Curved	24½
Brass Cast, 82-20, elliptical, 15 in. and longer	23½
Zinc: Cast, 99.99, 16 in. and over	16½
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	58

Chemicals

(Cents per lb., delivery from New York)

Copper cyanide, tech., 100-lb. bbls. 1-5	5.65
Copper sulphate, 99.5 crystals, bbls.	13.00-13.50
Nickel salts, single, 425-lb. bbls.	34.00
Silver cyanide, 100 oz., lots..40.82-41.135	
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc cyanide, 100-lb. dms.	33.00
Zinc sulphate, 89% crystals, bbls.	6.80

SCRAP

... News and Market Activities

August Mill Inventories Rise

••• The Pittsburgh scrap market this week seems to reflect on a small scale the conflicting market conditions throughout the country. In Boston, for instance, scrap prices have gone up whereas in Philadelphia, turnings and cast grades have dropped; in Cincinnati all open hearth grades have dropped, and in the New York area all open hearth grades are down a half dollar, and turnings are down a dollar a ton. It should be noted that the reduction in price of cast scrap in Philadelphia is a new development which bears watching as it may indicate a significant change in trend.

In a statement issued by the Bureau of Mines, showing stocks and consumption of iron and steel scrap up to the end of August, it is apparent that stocks of purchased and home scrap at plants of consumers, suppliers and producers approached 6,000,000 gross tons at the end of August. This represents an increase of 1 per cent over the previous month's total and is composed of 4,484,000 tons of purchased scrap and 1,492,000 tons of home scrap. Consumers' stocks at the end of August were 4,861,000 tons, an increase of nearly 100,000 tons over the previous month, most of which was comprised of home stocks. Combined stocks of suppliers and producers were 1,114,000 tons at the end of August, a reduction of 25,000 tons from the previous month.

CHICAGO—With scrap supplies abundant, selectivity is the keynote of the local market and only the more desirable open hearth grades are at all active. Particular attention appears to be given to avoiding material which might be contaminated, possibly with an eye upon resumption of production of deep drawing sheets at certain mills. So far railroads have been moderately successful in resisting scrap price pressure, but current differentials between No. 1 railroad heavy melting and other open hearth grades are so great that it is a matter of speculation as to how much longer they can be maintained. Railroad malleable also is holding up well. Cast grades continue to command shipping point prices plus approximately \$2.50 freight on more desirable items.

PITTSBURGH — The market here shows a mixed trend. No. 2 heavy melting steel has been sold at a sharply reduced figure. No. 1 heavy melting steel has been sold in the past week for \$16 a ton, involving approximately 5000 tons. In the past few days brokers and deal-

Chicago

••• All officers of the Chicago Chapter of the Institute of Scrap Iron and Steel, Inc., were re-elected last week, headed by William Pohn, Pohn Iron and Metal Co., Chicago, as president Frank Grossman, Grossman Brothers Co., Milwaukee is first vice president, Arthur M. Price, Price-Watson Co., Chicago, second vice president, John T. McEnroe, John T. McEnroe Co., Chicago, third vice president, Henry Rosenthal, Briggs and Turivas, Blue Island, Ill., treasurer, and Harvey Kaplan, M. S. Kaplan Co., Chicago, secretary. A proposal to list scrap metal on the New York Commodity Exchange was discussed with no support voiced by those present.

ers have been shying away from selling at \$16 a ton. Whether or not this is temporary remains to be seen. The market is quoted this week with a \$1 spread at \$15.50 to \$16.50 a ton, a quotation which adequately recognizes the apparent mixed trends in the market.

ST. LOUIS—While prices of scrap iron are unchanged, the market is said to be weaker, and it is expected that in this buyers' market the mills will cut their prices when they are ready to buy for November delivery. Brokers have had no difficulty in covering at present prices. More scrap is coming in from far away points than from those nearby. Railroad lists are being taken at prevailing prices.

CLEVELAND—In view of very few purchases of scrap in this area, a definite price structure is extremely difficult to establish. There have been sales made in Cleveland for delivery outside the area, particularly in the electric furnace grades and in turnings. Sales of turnings in Cleveland at \$8.50 have been made, but a freight absorption in excess of \$2.00 brings the price down to \$6.00 to \$6.50.

DETROIT—Scrap prices continue unchanged here this week. Opinion is mixed as to the future course of the market, some sources feeling that the continued flow of small orders indicates that the bottom has been reached and that future price moves were up. Others felt that cancellations for steel at the mills should prove a drag on the market which might prevent any rise in quotations and might cause further dips.

NEW YORK—In the face of a firmer market, the largest consumer of scrap from this area has reduced its buying prices for open hearth grades by 50c.

per ton in order to equalize the freight differential between its plant and eastern Pennsylvania mills. This action is calculated to distribute scrap offerings more evenly among local consumers. Certain brokers have refused to handle transactions at these prices. The same mill has reverted to use of its own prewar grade specifications. The New York and New Jersey chapters of the Institute of Iron and Steel Scrap have already sent a delegation to the mill to make representations about labor shortages preventing compliance with such specifications. Representations to government agencies are also contemplated. Turnings prices have dropped \$1. Cast prices remain at ceilings.

PHILADELPHIA—There has been little change in the scrap market here. One consumer who had been out of the market has returned, but shipments continue light. Dealers are showing some reluctance to sell scrap at the prevailing prices. For the third consecutive week, heavy melting grades have maintained their price levels.

BOSTON—With the American Steel & Wire Co. and other mills in the market, prices have definitely improved. A sale of 1300 tons of South Portland shipyard heavy steel at \$10.41 a ton started the recovery. More recent sales include 750 tons of Hingham shipyard steel at \$11 a ton, a round tonnage of Watertown Arsenal shoveling alloy turnings at \$5.66 a ton, and smaller tonnages of heavy steel at \$10.75 a ton, the current bottom price. While there is a better feeling in turnings, actual sales are limited and yard stocks are increasing.

BUFFALO — Quotations were unchanged this week, but confidence noted in trade circles indicated a stronger market. It is reported that the Pennsylvania Railroad list has brought 50c. to \$1 a ton more than a month ago. Purchase of No. 1 heavy melting at \$16.75 by a local mill has been confirmed. Most of the scrap moving here to mills consists of industrial and railroad items, as local yard operators generally hold for higher prices maintaining they cannot prepare material at the figures offered. Specialties appear firmer, although the volume of business is considerably below normal. Another 5000 tons of scrap arrived last week via the Barge Canal and at least 15,000 tons are reported booked for vessel shipment from the Upper Lakes next month.

CINCINNATI—The market appears to be a trifle uncertain in that prices are not appreciably changed but, on the other hand, trading has been light. Despite the lack of trading dealers indicate that present low prices are not justified by the supplies available and they are adopting a wary attitude.

BIRMINGHAM—Offered in the Birmingham area, but without immediate purchasers, are large tonnages of railroad and industrial scrap.

Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages (for ceiling prices see O. P. A. schedule No. 4).

PITTSBURGH

Per gross ton delivered to consumer:	
No. 1 hvy. melting..	\$15.50 to \$16.50
RR. hvy. melt.....	17.00 to 17.50
No. 2 hvy. melting..	14.00 to 14.50
RR. scrap rails....	21.50
Rails 3 ft. and under	23.50
No. 1 comp'd sheets.	15.50 to 16.00
Hand bldd. new shts.	15.50 to 16.00
Hvy. axle turn.....	15.50 to 16.00
Hvy. steel forge turn.	15.50 to 16.00
Mach. shop turn....	9.00 to 9.50
Short shov. turn....	12.00 to 12.50
Mixed bor. and turn..	9.50 to 10.00
Cast iron borings....	11.00 to 11.50
Hvy. break. cast....	16.50 plus frt.
No. 1 cupola.....	20.00 plus frt.
RR. knuck. and coup..	21.50
RR. coil springs....	21.50
Rail leaf springs....	21.50
Rolled steel wheels..	21.50
Low phos. billet crops	23.50 to 24.00
Low phos.....	18.50 to 19.50
RR malleable.....	22.00 plus frt.

CHICAGO

Per gross ton delivered to consumer:	
No. 1 hvy. melting..	\$16.25 to \$16.75
No. 2 hvy. melting....	15.25 to 15.75
No. 1 bundles.....	15.25 to 15.75
No. 2 dealers' bndls.	14.25 to 14.75
Galv. bundles (No.2)	12.25 to 12.75
Mach. shop turnings..	7.50 to 8.00
Short shovelling trngs.	8.00 to 8.50
Cast iron borings....	8.00 to 8.50
Mix. bor. & short turn.	8.00 to 8.50
Low phos. hvy. forge	19.50 to 20.00
Low phos. plates....	18.25 to 18.75
No. 1 RR hvy. mltng.	18.25 to 18.75
Reroll rails.....	22.25
Cut rails, 3 ft. and under	21.25 to 21.75
Locomotive tires, cut	18.75 to 19.25
Cut bolsters & side frames	18.25 to 18.75
Angles & splice bars..	20.25 to 20.75
No. 3 steel wheels....	18.25 to 18.75
Couplers & knuckles..	19.00 to 19.50
Miscellaneous rails...	19.25 to 19.75
Agricul. malleable...	20.00 to 20.50
RR malleable.....	21.00 to 21.50
Standard stl. car axles	23.00 to 23.50
FOB shipping point	
No. 1 mach. cast....	20.00
No. 1 agricul. cast....	20.00
Cast iron car wheels..	20.00
Hvy. breakable cast..	16.50
RR grate bars.....	15.25
Brake shoes.....	15.25
Stove plate.....	19.00
Clean auto cast.....	20.00

CINCINNATI

Per gross ton delivered to consumer:	
No. 1 hvy. melting..	\$15.00 to \$15.50
No. 2 hvy. melting....	14.00 to 14.50
No. 1 bundles.....	15.00 to 15.50
No. 2 bundles.....	13.00 to 13.50
Mach. shop turnings..	5.50 to 6.00
Shovelling turnings..	7.00 to 7.50
Cast iron borings....	7.50 to 8.00
Mixed bor. & turns..	6.00 to 6.50
No. 1 cupola cast....	21.00
Hvy. breakable cast..	16.50
Low phos. plate....	20.00 to 21.00
Scrap rails.....	20.00 to 21.00
Stove plate.....	15.50 to 16.00

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars	
No. 1 hvy. melting..	\$10.75 to \$11.00
No. 2 hvy. melting....	9.75 to 10.00
Bundled skeleton...	9.75 to 10.00
Turnings, shovellings.	5.75 to 6.50
Turnings, regular...	4.50 to 5.00
Mixed bor. & turns..	4.50 to 5.00
Mixed alloy turnings	4.00 to 5.00
Clean cast chem. bor.	13.06 to 14.15
Delivered to fctry. per gr. ton	
Breakable cast.....	21.57 to 21.87
Stove plate.....	20.00 to 23.51
Machinery cast, truck	21.00 to 23.51

DETROIT

Per gross ton, brokers' buying prices:	
No. 1 hvy. melting..	\$11.00 to \$11.50
No. 2 hvy. melting....	11.00 to 11.50
No. 1 bundles.....	11.00 to 11.50
New bushelling.....	11.00 to 11.50
Mach. shop turnings..	5.00 to 5.50
Short shov. turnings	6.25 to 6.75
Cast iron borings....	5.75 to 6.25
Mixed bor. & turns..	5.00 to 5.50
No. 1 cupola cast....	19.00 to 20.00
Charging box cast....	14.50 to 15.50
Hvy. breakable cast..	13.00 to 13.50
Stove plate.....	17.00 to 17.50
Flashings.....	11.00 to 11.50
Low phos. plate....	14.00 to 15.00
Automotive cast....	19.00 to 20.00

PHILADELPHIA

Per gross ton delivered to consumer:	
No. 1 hvy. melting..	\$14.50
No. 2 hvy. melting....	13.50
No. 2 bundles.....	12.50
Mach. shop turnings..	\$10.00 to 10.50
Shovelling turnings..	11.00 to 12.00
Cast iron borings....	11.00 to 11.50
Mixed bor. & turns..	10.00 to 10.50
No. 1 cupola cast....	*20.00
Hvy. breakable cast..	15.50 to *16.50
Cast, charging box..	18.00 to *19.00
Hvy. axle, forge turn.	16.00 to 16.25
Low phos. plate....	18.25 to 18.75
Low phos. punchings.	19.75 to 20.25
Billet crops.....	18.25 to 18.75
RR. steel wheels....	19.00 to 19.50
RR. coil springs....	19.00 to 19.50
RR. malleable.....	*22.00
*F.o.b. shipping point.	

ST. LOUIS

Per gross ton delivered to consumer:	
Hvy. melting.....	\$16.00
No. 1 locomotive tires.	\$16.00 to 16.50
Misc. stand. sec. rails	18.00 to 18.50
Railroad springs....	17.00 to 18.00
Bundled sheets.....	13.00 to 13.50
Heavy turnings.....	8.50 to 9.00
Rerolling rails.....	21.00
Steel car axles.....	23.50
Steel rails under 3 ft.	21.50
Steel angle bars....	19.00 to 19.50
Cast iron car wheels..	20.00
No. 1 machinery cast	20.00
Railroad malleable...	20.00 to 20.50
Breakable cast.....	16.50
Stove plate.....	17.00
Grate bars.....	15.25
Brake shoes.....	15.25
Note: Cast grades f.o.b. Shipping Point.	

BIRMINGHAM

Per gross ton delivered to consumer:	
No. 1 hvy. melting..	\$14.50 to \$15.00
No. 2 hvy. melting....	13.50 to 14.00
No. 2 bundles.....	12.50 to 13.00
No. 1 bushelling.....	11.50 to 12.00
Scrap rails.....	14.00 to 14.50
Rails for rerolling...	17.00 to 17.50
Rails 3 ft. & under..	17.00 to 17.50
Angles & splice bars..	16.50 to 17.00
Long turnings.....	4.50 to 5.00
Cast iron borings....	6.50 to 7.00
Steel axles.....	14.50 to 15.00
Stove plate.....	16.50 to 17.00
Bar crops and plate..	16.00 to 16.50
Structural and plate..	16.00 to 16.50
No. 1 cast.....	20.00 to 21.00
Cast, iron carwheels.	13.00 to 13.50

YOUNGSTOWN

Per gross ton delivered to consumer:	
No. 1 hvy. melting..	\$16.00 to \$16.50
No. 2 hvy. melting....	16.00 to 16.50
Low phos. plate....	17.00 to 18.00
No. 1 bushelling.....	16.00 to 16.50
Hydraulic bundles...	16.00 to 16.50
Mach. shop turnings..	9.00 to 9.50
Short shov. trngs..	11.00 to 11.50
Cast iron borings....	10.00 to 10.50

NEW YORK

Dealers' buying prices, per gross ton, on cars:	
No. 1 hvy. melting..	\$11.00 to \$11.50
No. 2 hvy. melting....	10.00 to 10.50
Hvy. comp. black bundles	9.00 to 9.50
Hvy. comp. galv. bundles	7.00 to 7.50
Hvy. breakable cast..	16.50
Charging box cast....	19.00
No. 1 cupola cast....	20.00
Clean auto cast....	20.00
Unstrip. motor bika..	17.50
Stove plate.....	19.00
Clean chem. cast bor.	14.33
Mach. shop turnings..	5.00 to 5.50
Mixed bor. & turns..	5.00 to 5.50

BUFFALO

Per gross ton delivered to consumer:	
No. 1 hvy. melting..	\$16.50 to \$17.00
No. 1 bundles.....	15.00 to 15.50
No. 2 bundles.....	14.00 to 14.50
No. 2 hvy. melting....	15.00 to 15.50
Mach. shop turnings..	9.00 to 9.50
Shovelling turnings..	11.00 to 11.50
Cast iron borings....	11.00 to 11.50
Mixed bor. & turns..	11.00 to 11.50
No. 1 cupola cast....	20.50 to 22.50
Stove plate.....	19.50 to 21.50
Low phos. plate....	21.75
Scrap rails.....	19.00 to 19.25
Rails 3 ft. & under..	22.75
RR steel wheels....	23.75
Cast iron car wheels..	20.50
RR coil & leaf sprgs.	23.75
RR knuckles & coup..	23.75
RR malleable.....	22.00
No. 1 bushelling.....	15.00 to 15.50

CLEVELAND

Per gross ton delivered to consumer:	
No. 1 hvy. melting..	\$15.50 to \$16.00
No. 2 hvy. melting....	15.50 to 16.00
Compressed sheet stl.	15.50 to 16.00
Drop forge flashings..	15.50 to 16.00
No. 2 bundles.....	14.50 to 15.00
Mach. shop turnings..	6.00 to 6.50
Short shov. trngs..	10.00 to 11.00
No. 1 bushelling.....	15.00 to 15.50
Steel axle turnings..	15.00 to 15.50
Low phos. billet and bloom crops	20.00 to 21.00
Cast iron borings....	10.00 to 11.00
Mixed bor. & turns..	10.00 to 11.00
No. 2 bushelling.....	13.00 to 13.50
No. 1 machine cast..	20.00 plus frt.
Railroad cast.....	30.00 plus frt.
Railroad grate bars..	15.25
Stove plate.....	19.00 plus frt.
RR. hvy. melting....	17.00 to 17.50
Rails 3 ft. & under..	23.00 to 23.50
Rails 18 in. & under	24.25 to 24.75
Rails for rerolling...	23.00 to 23.50
Railroad malleable...	22.00 plus frt.
Elec. furnace punch..	18.50 to 19.50

SAN FRANCISCO

Per gross ton delivered to consumer:	
No. 1 hvy. melting..	\$16.00 to \$16.75
RR hvy. melting....	16.00 to 16.75
No. 2 hvy. melting....	15.00 to 15.75
No. 2 bales.....	14.00 to 14.75
No. 3 bales.....	10.00 to 10.75
Mach. shop turnings..	7.00
Elec. furn. 1 ft. under	16.00 to 17.50
No. 1 cupola cast....	20.00 to 22.00

LOS ANGELES

Per gross ton delivered to consumer:	
No. 1 hvy. melting..	\$15.00 to \$16.00
No. 2 hvy. melting....	14.00 to 15.00
No. 2 bales.....	13.00 to 14.00
No. 3 bales.....	10.00 to 10.50
Mach. shop turnings..	5.00
No. 1 cupola cast....	20.00 plus frt.

SEATTLE

Per gross ton delivered to consumer:	
No. 1 hvy. melting..	\$13.50
RR hvy. melting....	13.50
No. 3 bundles.....	11.50
Elec. furn. 1 ft. und.	\$16.00 to 17.00
No. 1 cupola cast....	20.00 plus frt.

Comparison of Prices . . .

Advances Over Past Week in Heavy Type; Declines in *Italics*.

(Prices Are F.O.B. Major Basing Points)

Flat Rolled Steel: (Cents Per Lb.)	Oct. 24, 1944	Oct. 17, 1944	Sept. 19, 1944	Oct. 26, 1943
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00

Tin and Terne Plate: (Dollars Per Base Box)	Oct. 24, 1944	Oct. 17, 1944	Sept. 19, 1944	Oct. 26, 1943
Tin plate, standard cokes	\$5.00	\$5.00	\$5.00	\$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30

Bars and Shapes: (Cents Per Lb.)	Oct. 24, 1944	Oct. 17, 1944	Sept. 19, 1944	Oct. 26, 1943
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40

Wire and Wire Products: (Cents Per Lb.)	Oct. 24, 1944	Oct. 17, 1944	Sept. 19, 1944	Oct. 26, 1943
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55

Rails: (Dollars Per Gross Ton)	Oct. 24, 1944	Oct. 17, 1944	Sept. 19, 1944	Oct. 26, 1943
Heavy rails	\$40.00	\$40.00	\$40.00	\$40.00
Light rails	40.00	40.00	40.00	40.00

Semi-Finished Steel: (Dollars Per Gross Ton)	Oct. 24, 1944	Oct. 17, 1944	Sept. 19, 1944	Oct. 26, 1943
Rerolling billets	\$34.00	\$34.00	\$34.00	\$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs, rerolling	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00

Wire Rods and Skelp: (Cents Per Lb.)	Oct. 24, 1944	Oct. 17, 1944	Sept. 19, 1944	Oct. 26, 1943
Wire rods	2.00	2.00	2.00	2.00
Skelp	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	Oct. 24, 1944	Oct. 17, 1944	Sept. 19, 1944	Oct. 26, 1943
No. 2 fdy., Philadelphia	\$25.84	\$25.84	\$25.84	\$25.84
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	25.11	25.11	25.11	24.68
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.34	25.34	25.34	25.39
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	37.34	37.34	37.34	31.34
Ferromanganese†	135.00	135.00	135.00	135.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)	Oct. 24, 1944	Oct. 17, 1944	Sept. 19, 1944	Oct. 26, 1943
Heavy melt'g steel, P'gh	\$16.00	\$16.25	\$17.75	\$20.00
Heavy melt'g steel, Phila.	14.50	14.50	16.375	18.75
Heavy melt'g steel, Ch'go	16.50	16.50	18.75	18.75
No. 1 hy. comp. sheet, Det.	11.25	11.25	12.75	17.85
Low phos. plate, Youngs'n	17.50	17.50	17.75	22.50
No. 1 cast, Pittsburgh	20.00*	20.00*	22.50	20.00
No. 1 cast, Philadelphia	20.00*	20.00*	20.00	20.00
No. 1 cast, Chicago	20.00*	20.00*	22.17	20.00

*F.o.b. shipping point.

Coke, Connellsville: (Per Net Ton at Oven)	Oct. 24, 1944	Oct. 17, 1944	Sept. 19, 1944	Oct. 26, 1943
Furnace coke, prompt	\$7.00	\$7.00	\$7.00	\$6.50
Foundry coke, prompt	8.25	8.25	8.25	7.50

Non-Ferrous Metals: (Cents per Lb. to Large Buyers)	Oct. 24, 1944	Oct. 17, 1944	Sept. 19, 1944	Oct. 26, 1943
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	14.50	14.50	14.50	14.50

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 168-179.

Composite Prices . . .

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue.

FINISHED STEEL	
October 24, 1944	2.25513c. a Lb.
One week ago	2.25513c. a Lb.
One month ago	2.25513c. a Lb.
One year ago	2.26190c. a Lb.

	HIGH	LOW
1943	2.25513c.	2.25513c.
1942	2.26190c.	2.26190c.
1941	2.43078c.	2.43078c.
1940	2.30467c., Jan. 2	2.24107c., Apr. 16
1939	2.35367c., Jan. 3	2.26689c., May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18
1937	2.58414c., Mar. 9	2.32263c., Jan. 4
1936	2.32263c., Dec. 28	2.05200c., Mar. 10
1935	2.07642c., Oct. 1	2.06492c., Jan. 8
1934	2.15367c., Apr. 24	1.95757c., Jan. 2
1933	1.95578c., Oct. 3	1.75836c., May 2
1932	1.89196c., July 5	1.83901c., Mar. 1
1931	1.99626c., Jan. 13	1.86586c., Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29

Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

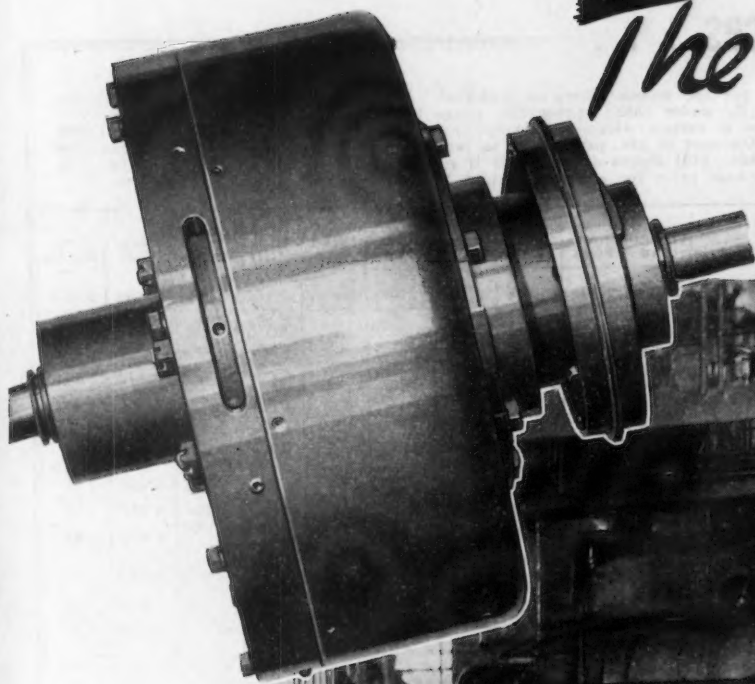
PIG IRON	
23.61 a Gross Ton	23.61 a Gross Ton
23.61 a Gross Ton	23.61 a Gross Ton
23.61 a Gross Ton	23.61 a Gross Ton
23.61 a Gross Ton	23.61 a Gross Ton
23.61, Mar. 20	23.45, Jan. 2
23.45, Dec. 23	22.61, Jan. 2
22.61, Sept. 19	20.61, Sept. 12
23.25, June 21	19.61, July 6
23.25, Mar. 9	20.25, Feb. 16
19.74, Nov. 24	18.73, Aug. 11
18.84, Nov. 5	17.83, May 14
17.90, May 1	16.90, Jan. 27
16.90, Dec. 5	13.56, Jan. 3
14.81, Jan. 5	13.56, Dec. 6
15.90, Jan. 6	14.79, Dec. 15
18.21, Jan. 7	15.90, Dec. 16
18.71, May 14	18.21, Dec. 17

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

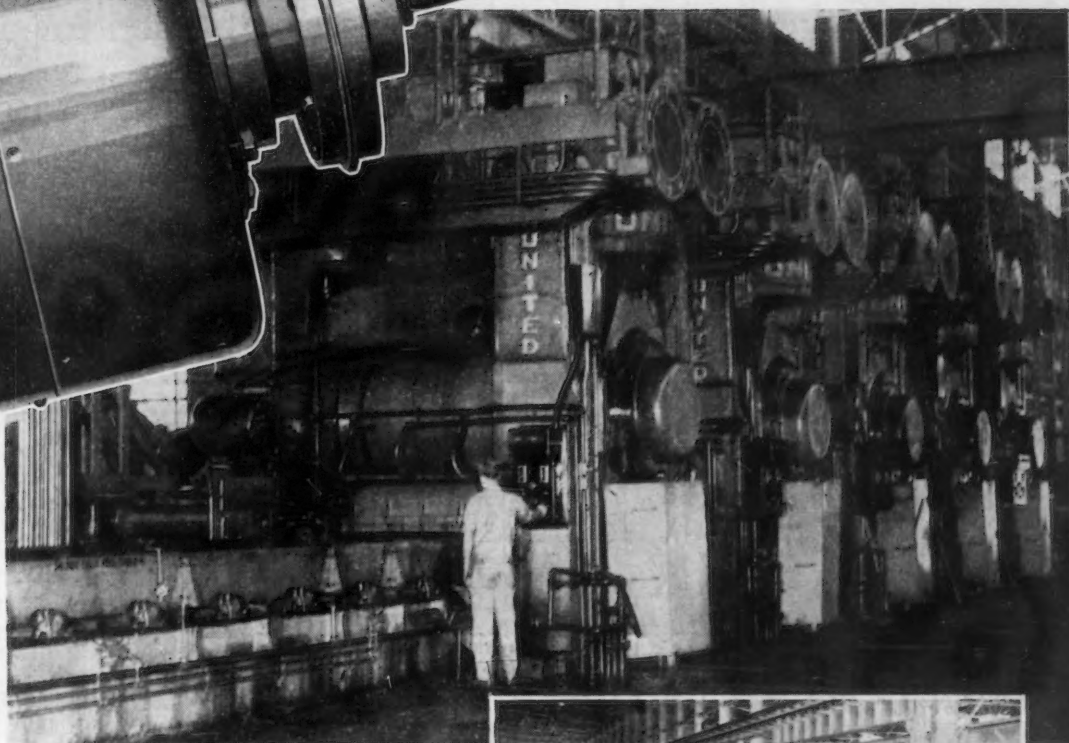
SCRAP STEEL	
\$15.67 a Gross Ton	\$15.67 a Gross Ton
\$15.75 a Gross Ton	\$15.75 a Gross Ton
\$17.625 a Gross Ton	\$17.625 a Gross Ton
\$19.17 a Gross Ton	\$19.17 a Gross Ton
\$19.17, Apr. 10	\$22.00, Jan. 7
16.04, Apr. 9	21.83, Dec. 30
14.08, May 16	22.50, Oct. 3
11.00, June 7	15.00, Nov. 22
12.67, June 8	21.92, Mar. 30
12.67, June 9	17.75, Dec. 21
10.33, Apr. 29	13.42, Dec. 10
9.50, Sept. 25	13.00, Mar. 13
6.75, Jan. 3	12.25, Aug. 8
6.43, July 5	8.50, Jan. 12
8.50, Dec. 29	11.33, Jan. 6
11.25, Dec. 9	15.00, Feb. 18
14.08, Dec. 3	17.58, Jan. 29

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

The "MILL-TYPE" Clutch



Right: 28" & 54" x 80" 5-stand tandem hot finishing train equipped with five 24" Type SD Dings Magnetic Clutches.



Dings Magnetic Clutches . . . Accepted Standard of Leading Mills Everywhere.

Dings Magnetic Clutches are ideally suited to control of screwdown on mill stands and for other power transmission jobs where smooth, dependable operation and remote control are desirable.

Dings clutches take hold of the load smoothly and release it with no drag. Special design keeps lubricant away from friction surfaces. High torque is insured by proper relation between friction area, mean diameter, coefficient of friction and pressure. Frictions are long lasting and easy to replace. The magnet is wound for years of trouble-free service.

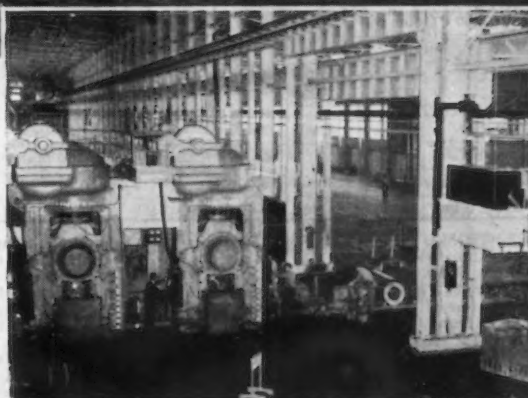
Dings—magnetic engineers since 1899—pioneered heavy duty magnetic clutch design. Call on them for trouble-free transmission.

DINGS MAGNETIC SEPARATOR CO.
516 E. Smith St., Milwaukee 7, Wis.

World's Largest
Exclusive Builders
of Magnetic
Equipment

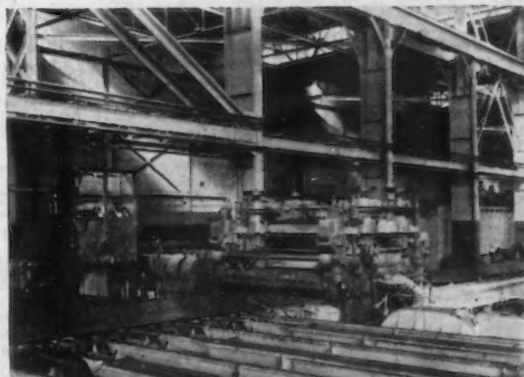


Magnetic Separators . . . Lifting Magnets . . . Magnetic Clutches



Below: 110" plate mill, heavy leveler, equipped with Dings Magnetic Clutches.

Above: Two stand tandem 20" & 49" x 71" cold reduction mill at large aluminum plant — with Dings Clutch on each stand.



Finished Iron and Steel Prices . . .

Steel prices shown here are f.o.b. basing points, in cents per lb., unless otherwise indicated. Extras apply. Delivered prices do not reflect 3% tax on freight. (1) Mill run sheet, 10c. per lb. under base; primes 25c. above base. (2) Unassorted 8-lb. coating. (3) Widths up to 12-in. (4) 0.25 carbon and less. (5) Applies to certain width and length limitations. (6) For merchant trade. (7) For straight length material only from producer to consumer. Discount of 25c. per 100 lb. to fabricators. (8) Also shafting. For quantities of 20,000 to 29,999 lb. (9) Carload lot in manufacturing trade. (10) Prices do not apply if rail and water is not used. (11) Boxed. (12) Portland and Seattle price, San Francisco 2.50c. (14) This base price for annealed, bright finish wires, commercial spring wire.

Basing Point Product	Pitts- burgh	Chicago	Gary	Cleve- land	Birm- ingham	Buffalo	Youngs- town	Spar- rows Point	Granite City	Middle- town, Ohio	Gulf Ports, Cars	Provo, Utah	Pacific Ports, Cars	DELIVERED TO		
														Detroit	New York	Phila- delphia
Hot Rolled Sheets	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢	2.20¢	2.10¢			2.05¢	2.20¢	2.34¢	2.27¢
Cold Rolled Sheets ¹	3.05¢	3.05¢	3.05¢	3.05¢		3.05¢	3.05¢		3.15¢	3.05¢			3.70¢	3.15¢	3.39¢	3.37¢
Galv. Sheets (24 gage)	3.50¢	3.50¢	3.50¢		3.50¢	3.50¢	3.50¢	3.50¢	3.60¢	3.50¢			4.05¢		3.74¢	3.67¢
Enameling Sheets (20 gage)	3.35¢	3.35¢	3.35¢	3.35¢			3.35¢		3.45¢	3.35¢			4.00¢	3.45¢	3.71¢	3.67¢
Long Terns ²	3.80¢	3.80¢	3.80¢										4.55¢		4.16¢	4.12¢
Hot Rolled Strip ³	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢			2.10¢			2.75¢	2.20¢	2.46¢	
Cold Rolled Strip ⁴	2.80¢	2.90¢		2.80¢			2.80¢		(Worcester=3.00¢)					2.90¢	3.16¢	
Cooperage Stock Strip	2.20¢	2.20¢			2.20¢		2.20¢								2.56¢	
Commodity C-R Strip	2.95¢	3.05¢		2.95¢			2.95¢		(Worcester=3.35¢)					3.05¢	3.31¢	
Coke Tin Plate, Base Box	\$5.00	\$5.00	\$5.00						\$5.10						5.86¢	5.82¢
.50 Electro Tin Plate, Box	\$4.50	\$4.50	\$4.50						\$4.60							
.75	\$4.65		\$4.65						\$4.75							
Black Plate (29 gage) ⁵	3.05¢	3.05¢	3.05¢						3.15¢				4.05¢ ¹¹			3.37¢
Mfg. Terns, Special Box	\$4.30	\$4.30	\$4.30						\$4.40							
Carbon Steel Bars	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			(Duluth=2.25¢)	2.50¢			2.80¢	2.25¢	2.49¢	2.47¢
Rail Steel Bars ⁶	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢				2.50¢			2.80¢			
Reinforcing (Billet) Bars ⁷	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢		2.50¢			2.55¢ ¹¹	2.25¢	2.39¢	
Reinforcing (Rail) Bars ⁷	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢	2.15¢			2.50¢			2.55¢ ¹¹	2.25¢		2.47¢
Cold Finished Bars ⁸	2.65¢	2.65¢	2.65¢	2.65¢		2.65¢			(Detroit=2.70¢)			(Toledo=2.80¢)		2.99¢	2.97¢	
Alloy Bars, Hot Rolled	2.70¢	2.70¢				2.70¢			(Bethlehem, Massillon, Canton=2.70¢)					2.80¢		
Alloy Bars, Cold Drawn	3.35¢	3.35¢	3.35¢	3.35¢		3.35¢								3.45¢		
Carbon Steel Plates	2.10¢	2.10¢	2.10¢	2.10¢	2.10¢		2.10¢		(Colesville and Claymont=2.10¢)	2.10¢	2.35¢	2.45¢	2.60¢	2.65¢	2.32¢	2.29¢
Floor Plates	3.35¢	3.35¢									3.70¢			4.00¢		3.71¢
Alloy Plates	3.50¢	3.50¢							(Colesville=3.50¢)		3.95¢			4.15¢		3.70¢
Structural Shapes	2.10¢	2.10¢	2.10¢		2.10¢	2.10¢			(Bethlehem=2.10¢)	2.45¢			2.75¢		2.27¢	2.215¢
SPRING STEEL, C-R																
0.26 to 0.50 Carbon	2.80¢			2.80¢					(Worcester=3.00¢)							
0.51 to 0.75 Carbon	4.30¢			4.30¢					(Worcester=4.50¢)							
0.76 to 1.00 Carbon	6.15¢			6.15¢					(Worcester=6.35¢)							
1.01 to 1.25 Carbon	8.35¢			8.35¢					(Worcester=8.55¢)							
Bright Wire ¹⁴	2.60¢	2.60¢		2.60¢	2.60¢				(Worcester=2.70¢) (Duluth=2.65¢)				3.10¢			2.92¢
Galvanized Wire									Add proper size extra and galvanizing extra to Bright Wire base							
Spring (High Carbon)	3.20¢	3.20¢		3.20¢					(Worcester=3.30¢)				3.70¢			3.52¢
Steel Sheet Piling	2.40¢	2.40¢				2.40¢							2.95¢			2.72¢

EXCEPTIONS TO PRICE SCHED. NO. 6
 Slabs—Andrews Steel Co. \$41 basing pts.; Wheeling Steel Corp. (rerolling) 4 in. sq. or larger \$37.75 f.o.b. Portsmouth, Ohio; Empire Sheet & Tin Plate Corp. \$41; Phoenix Iron Co. (rerolling) \$41, (forging) \$47; Granite City Steel \$47.50. Blooms—Phoenix Iron Co. (rerolling) \$41, (forging) \$47; Pgh. Steel Co. (reroll) \$38.25, (forging) \$44.25. Wheeling Steel Corp. (rerolling) 4 in. sq. or larger \$37.75 f.o.b. Portsmouth.
 Sheet bar—Empire Sheet & Tin Plate Co. \$39 mill; Wheeling Steel Corp. \$38 Portsmouth, Ohio.
 Billets, Forging—Andrews Steel Co. \$50 basing pts.; Follanshee Steel Corp. \$49.50 Toronto; Phoenix Iron Co. \$47.00 mill. Geneva Steel Co. \$64.64 f.o.b. Pacific Coast; Pittsburgh Steel Co. \$49.50.
 Billets, Rerolling—Continental Steel Corp. may charge Acme Steel in Chicago switching area \$34 plus freight from Kokomo, Ind.; Northwestern Steel & Wire Co. (Lend-Lease) \$41 mill; Wheeling Steel Corp. 4 in. sq. or larger \$37.75, smaller \$39.50 f.o.b. Portsmouth, Ohio; Stanley Works may sell Washburn Wire Co. under allocation at \$39 Bridgeport, Conn.; Keystone Steel & Wire Co. may sell Acme Steel Co. at Chicago base, f.o.b. Peoria; Phoenix Iron Co. \$41 mill; Continental Steel Corp. (1½ x 1½) \$39.50, (2 x 2) \$40.60 Kokomo, Ind. (these prices include \$1 size extra); Keystone Steel & Wire Co. \$36.40 Peoria; Connors Steel Co. \$50.69 Birmingham; Ford Motor Co. \$34 Dearborn, Mich. Geneva Steel Co. \$58.64 f.o.b. Pac. C. Pgh. Steel Co. \$43.50.

Structural Shapes—Phoenix Iron Co. \$23.35 basing pts. (export) \$25.00 Phoenixville; Knoxville Iron Co. \$23.30 basing points.
 Rails—Sweet Steel Co. (rail steel) \$50 mill; West Virginia Rail Co. (lightweight) on allocation based Huntington, W. Va.; Colorado Fuel & Iron Corp., \$45 Pueblo.
 Hot Rolled Plate—Granite City Steel Co. \$26.55 mill; Knoxville Iron Co. \$22.25 basing pts.; Kaiser Co. and Geneva Steel Co. \$3.20 Pacific Ports; Central Iron and Steel Co. \$2.50 basing points; Granite City Steel Co. \$2.35 Granite City.
 Merchant Bars—W. Ames Co., 10 tons and over, \$2.85 mill; Eckels-Nye Steel Corp., \$2.50 basing pts. (rail steel) \$2.40; Phoenix Iron Co. \$2.40 basing pts.; Sweet Steel Co. (rail steel) \$2.35 mill; Joslyn Mfg. & Supply Co., \$2.35 Chicago; Calumet Steel Div., Borg Warner Corp. (8 in. mill bar) \$2.35 Chicago; Knoxville Iron Co. \$2.30 basing pts. Laclede Steel Co., sales to LaSalle Steel granted Chicago base, f.o.b. Madison, Ill. Milton Mfg. Co. \$2.75 f.o.b. Milton, Pa.
 Pipe Skelp—Wheeling Steel Corp., Benwood, \$2.05 per cwt.
 Reinforcing Bars—W. Ames & Co., 10 tons and over, \$2.85 mill; Sweet Steel Co. (rail steel) \$2.35 mill; Columbia Steel Co. \$2.50 Pacific Ports.
 Cold Finished Bars—Keystone Drawn Steel Co. on allocation, Pittsburgh c.f. base plus c/l freight on hot rolled bars Pittsburgh to Spring City, Pa.; New England Drawn Steel Co. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to Massfield, Mass., f.o.b. Massfield; Empire Finished Steel

Corp. on allocation outside New England, Buffalo c.f. base plus c/l freight Buffalo to plants f.o.b. plant; Compressed Steel Shafting Co. on allocation outside New England, Buffalo base plus c/l freight Buffalo to Readville, Mass. f.o.b. Readville; Medart Co. in certain areas. Chicago c.f. base plus c/l freight Chicago to St. Louis, f.o.b. St. Louis.
 Alloy Bars—Texas Steel Co. for delivery except Texas and Okla. Chicago, base, f.o.b. Fort Worth, Tex.; Connors Steel Co. shipped outside Ala., Mississippi, Louisiana, Georgia, Florida, Tenn., Pittsburgh base, f.o.b. Birmingham.
 Hot Rolled Strip—Joslyn Mfg. & Supply Co. \$2.30 Chicago; Knoxville Iron Co. \$2.25 basing pts.
 Hot Rolled Sheets—Andrews Steel Co., Middletown base on shipments to Detroit or area; Parkersburg Iron & Steel Co., \$2.25 Parkersburg.
 Galvanized Sheets—Andrews Steel Co., \$3.75 basing pts.; Parkersburg Iron & Steel Co. \$3.85 Parkersburg; Apollo Steel Co. \$3.75 basing, pts.; Continental Steel Co., Middletown base on Kokomo, Ind., product; Superior Sheet Steel Co., Pittsburgh base except for Lend-Lease.
 Pipe and Tubing—South Chester Tube Co. when priced at Pittsburgh, freight to Gulf Coast and Pacific Ports may be charged from Chester, Pa., also to points lying west of Harrisburg, Pa.
 Black Sheets—Empire Sheet and Tinplate Co., maximum base price mill is \$2.45 per 100 lb., with differentials, transportation charges, etc., provided in RPS. No. 6.

OFFICIAL U. S. NAVY PHOTOGRAPH

NIGHT ATTACK-

Calls for even Greater Accuracy

When enemy planes dive from the moonless sky, the accuracy of men and guns is tested to their limit. American anti-aircraft guns are meeting this test in battle after battle . . . proving again and again the strength of their weldments and the precision of their machining.

Danly is proud to be among the outstanding steel fabrication firms chosen by the Navy for this precision welding and machining. These Navy weldments and other vital wartime fabrication jobs are adding to the store of Danly know-how, for better service when vastly increased facilities become available to industry.

DANLY MACHINE SPECIALTIES, INC.
2100 SO. 52nd AVE.  CHICAGO 50, ILLINOIS

DANLYWELD

Danly Die Sets • Die Makers' Supplies • Welded Steel Fabrication

PRICES

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates 1/4 in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled NE 8617-20	Hot Rolled NE 9442-45 Ann.	Cold Drawn NE 8617-20	Cold Drawn NE 9442-45 Ann.
Philadelphia	3.518	4.872*	5.018a	3.922	4.772	3.605	3.666	3.822	4.072	5.966	7.066	7.272	8.322
New York	3.590	4.613*	5.010	3.974*	4.772	3.768	3.758	3.833	4.103	6.008	7.108	7.303	8.353
Boston	3.744	4.744*	5.224*	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.262	7.344	8.394
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.799	3.802	4.052				
Norfolk	3.771	4.965	5.371	4.165	4.885	3.971	4.002	4.065	4.165				
Chicago	3.25	4.20	5.231	3.60	4.651*	3.55	3.55	3.50	3.75	5.75	6.85	6.85	7.90
Milwaukee	3.387	4.337*	5.272*	3.737	4.7871*	3.687	3.687	3.637	3.887	5.887	7.087	7.087	8.137
Cleveland	3.35	4.40	4.874*	3.60	4.45	3.40	3.588	3.35	3.75	5.956	7.056	6.85	7.90
Buffalo	3.35	4.40	4.75*	3.819	4.689	3.63	3.40	3.35	3.75	5.75	6.85	6.85	7.90
Detroit	3.45	4.50	5.00*	3.70	4.6591*	3.609	3.661	3.45	3.80	6.08	7.18	7.159	8.269
Cincinnati	3.425	4.475*	4.825*	3.675	4.711	3.611	3.691	3.611	4.011				
St. Louis	3.397	4.347*	5.172*	3.747	4.9311*	3.697	3.697	3.647	4.031	6.131	7.231	7.231	8.281
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	6.85	6.85	7.90
St. Paul	3.51	4.48	5.257*	3.86	4.351*	3.811*	3.811*	3.761*	4.361	6.09	7.19	7.561	8.71*
Omaha	3.865	5.443	5.808*	4.215		4.165	4.165	4.115	4.43				
Indianapolis	3.58	3.58	4.568	4.918	3.768	4.79	3.63	3.58	3.98	8.08	7.18	7.18	8.23
Birmingham	3.45		4.75	3.70		3.55	3.55	3.50	4.43				
Memphis	3.965*	4.66	3.285	4.215		4.065	4.065	4.015	4.33				
New Orleans	4.058*	4.95	5.358	4.308		4.158	4.158*	4.108*	4.629				
Houston	3.763	5.573	6.313*	4.313		4.25	4.25	3.75	6.373*	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.20*	6.104	4.95	5.8131*	4.95	4.65	4.40	5.593	8.304	9.404	9.404	10.454
San Francisco	4.551*	7.30*	6.35*	4.501*	7.3331*	4.651*	4.351*	4.151*	5.333	8.304	9.404	9.404	10.454
Seattle	4.651*	7.05*	5.95*	4.251*		4.751*	4.451*	4.351*	5.763				
Portland	4.651*	6.50*	5.75*	4.751*		4.751*	4.451*	4.451*	5.533	8.304	9.404	8.304	9.404
Salt Lake City	4.531*		6.171*	5.531*		4.981*	4.981*	4.881*	5.90				

MILL EXTRAS FOR NATIONAL EMERGENCY STEELS

Designa- tion	Basic Open-Hearth		Electric Furnace		Designa- tion	Basic Open-Hearth		Electric Furnace	
	Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs		Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs
NE 1330	0.10¢	\$2.00			NE 9415	0.75¢	\$15.00	\$1.25	\$25.00
NE 1335	0.10	2.00			NE 9417	0.75	15.00	1.25	25.00
NE 1340	0.10	2.00			NE 9420	0.75	15.00	1.25	25.00
NE 1345	0.10	2.00			NE 9422	0.75	15.00	1.25	25.00
NE 1350	0.10	2.00			NE 9425	0.75	15.00	1.25	25.00
					NE 9427	0.75	15.00	1.25	25.00
NE 8612	0.65¢	\$13.00	\$1.15	\$23.00	NE 9430	0.75	15.00	1.25	25.00
NE 8615	0.65	13.00	1.15	23.00	NE 9432	0.75	15.00	1.25	25.00
NE 8617	0.65	13.00	1.15	23.00	NE 9435	0.75	15.00	1.25	25.00
NE 8620	0.65	13.00	1.15	23.00	NE 9437	0.75	15.00	1.25	25.00
NE 8622	0.65	13.00	1.15	23.00	NE 9440	0.75	15.00	1.25	25.00
NE 8625	0.65	13.00	1.15	23.00	NE 9442	0.80	16.00	1.30	26.00
NE 8627	0.65	13.00	1.15	23.00	NE 9445	0.80	16.00	1.30	26.00
NE 8630	0.65	13.00	1.15	23.00	NE 9447	0.80	16.00	1.30	26.00
NE 8632	0.65	13.00	1.15	23.00	NE 9450	0.80	16.00	1.30	26.00
NE 8635	0.65	13.00	1.15	23.00					
NE 8637	0.65	13.00	1.15	23.00	NE 9722	0.65¢	\$13.00	\$1.15	\$23.00
NE 8640	0.65	13.00	1.15	23.00	NE 9727	0.65	13.00	1.15	23.00
NE 8642	0.65	13.00	1.15	23.00	NE 9732	0.65	13.00	1.15	23.00
NE 8645	0.65	13.00	1.15	23.00	NE 9737	0.65	13.00	1.15	23.00
NE 8647	0.65	13.00	1.15	23.00	NE 9742	0.65	13.00	1.15	23.00
NE 8650	0.65	13.00	1.15	23.00	NE 9745	0.65	13.00	1.15	23.00
					NE 9747	0.65	13.00	1.15	23.00
NE 8712	0.70¢	\$14.00	\$1.20	\$24.00	NE 9750	0.65	13.00	1.15	23.00
NE 8715	0.70	14.00	1.20	24.00	NE 9763	0.65	13.00	1.15	23.00
NE 8717	0.70	14.00	1.20	24.00	NE 9768	0.65	13.00	1.15	23.00
NE 8720	0.70	14.00	1.20	24.00					
NE 8722	0.70	14.00	1.20	24.00	NE 9830	\$1.30	\$26.00	\$1.80	\$36.00
NE 8725	0.70	14.00	1.20	24.00	NE 9832	1.30	26.00	1.80	36.00
NE 8727	0.70	14.00	1.20	24.00	NE 9835	1.30	26.00	1.80	36.00
NE 8730	0.70	14.00	1.20	24.00	NE 9837	1.30	26.00	1.80	36.00
NE 8732	0.70	14.00	1.20	24.00	NE 9840	1.30	26.00	1.80	36.00
NE 8735	0.70	14.00	1.20	24.00	NE 9842	1.30	26.00	1.80	36.00
NE 8737	0.70	14.00	1.20	24.00	NE 9845	1.30	26.00	1.80	36.00
NE 8740	0.70	14.00	1.20	24.00	NE 9847	1.30	26.00	1.80	36.00
NE 8742	0.70	14.00	1.20	24.00	NE 9850	1.30	26.00	1.80	36.00
NE 8745	0.70	14.00	1.20	24.00					
NE 8747	0.70	14.00	1.20	24.00	NE 9912	\$1.20	\$24.00	\$1.55	\$31.00
NE 8750	0.70	14.00	1.20	24.00	NE 9915	1.20	24.00	1.55	31.00
					NE 9917	1.20	24.00	1.55	31.00
NE 9255	0.40¢	\$8.00			NE 9920	1.20	24.00	1.55	31.00
NE 9260	0.40	8.00			NE 9922	1.20	24.00	1.55	31.00
NE 9261	0.65	13.00			NE 9925	1.20	24.00	1.55	31.00
NE 9262	0.65	13.00							
					NE 52100A		\$2.60		\$52.00
					NE 52100B		2.60		52.00
					NE 52100C		2.60		52.00

Note 1: The ranges shown are restricted to sizes 100 sq. in. or less or equivalent cross-sectional area 18 in. wide or under, with a maximum individual piece weight of 7000 lb. irrespective of size. Note 2: For steels ordered to such ranges, below the size and weight restriction, the average of all the chemical checks must be within the limits specified subject to check analysis variations given in Table 4, Section 10, A.I.S.I. Steel Products Manual. Note 3: When acid open-hearth is specified and acceptable, add to basic open-hearth alloy differential 0.25c. per lb. for bars and bar strip and \$5 per gross ton for billets, blooms and slabs. Note 4: The extras shown are in addition to the base price of \$2.70 for 100 lb. on finished products and \$54 per gross ton on semi-finished steel, major basing points, and are in cents per pound when applicable to bars and bar-strip, and in dollars per gross ton when applicable to billets, blooms and slabs. The full extra applicable over the base price is the total of all extras indicated by the specific requirements of the order. The higher extra shall be charged for any size falling between two published extras.

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 1999 lb. (7) 400 to 1999 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over. (* Philadelphia: Galvanized sheet, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.271c. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% Fe, Natural Content, Delivered Lower Lake Ports*)

Per Gross Ton
Old range, bessemer, 51.50 \$4.75
Old range, non-bessemer, 51.50 4.60
Mesaba, bessemer, 51.50 4.60
Mesaba, non-bessemer, 51.50 4.45
High phosphorus, 51.50 4.35
*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

FLUORSPAR

Maximum price f.o.b. consumer's plant, \$30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Base price per short ton
Effective CaF₂ Content:
70% or more \$33.00
65% but less than 70% 32.00
60% but less than 65% 31.00
Less than 60% 30.00

PRICES

SEMI-FINISHED STEEL

Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill. . . . \$31.00
Exceptions: Phoenix Iron Co. may charge \$38.75; Kaiser Co., \$43.00 f.o.b. Pacific Coast ports; Empire Sheet & Tinplate Co., \$34.25; Pgh. Steel Co., \$33.10.

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown \$36.00
Exceptions: Phoenix Iron Co. may charge \$43.00; Empire Sheet & Tinplate Co., \$39.25, f.o.b. Mansfield, Ohio; West Coast producers, \$48.00, f.o.b. Pacific Coast Ports; Pgh. Steel Co., \$33.10.

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh \$45.00
Exceptions: C/L delivered Detroit add \$2.00; delivered East Michigan add \$3.00. Connors Steel Co. may charge \$45.00 f.o.b. Birmingham.

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are \$2.00 higher; delivered E. Michigan, \$3 higher; f.o.b. Duluth, billets only, \$2.00 higher; billets f.o.b. Pacific ports are \$12 higher. Provo, \$11.20 higher. Delivered prices do not reflect three per cent tax on freight rates.

Per Gross Ton
 Rerolling \$34.00
 Forging quality 40.00

For exceptions on semi-finished steel see the footnote on the page of finished steel prices.

Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton \$54.00
 Price delivered Detroit \$2.00 higher; E. Michigan, \$3.00 higher.

Shell Steel

Per Gross Ton
 3 in. to 12 in. \$52.00
 12 in. to 18 in. 54.00
 18 in. and over 56.00
 Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.
 Prices delivered Detroit are \$2.00 higher; E. Michigan, \$3 higher.
 Price Exception: Follansbee Steel Corp. permitted to sell at \$13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of \$52.00.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.
Per Gross Ton
 Open hearth or bessemer \$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.
Per Lb.
 Grooved, universal and sheared . . 1.90c.

Wire Rods

(No. 5 to 9/32 in.)
Per Lb.
 Pittsburgh, Chicago, Cleveland . . . 2.00c.
 Worcester, Mass. 2.10c.
 Birmingham 2.00c.
 San Francisco 2.50c.
 Galveston 2.25c.
 9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse)
Base per lb.
 High speed 67c.
 Straight molybdenum 54c.
 Tungsten-molybdenum 57 1/2c.
 High-carbon-chromium 43c.
 Oil hardening 24c.
 Special carbon 22c.
 Extra carbon 18c.
 Regular carbon 14c.
 Warehouse prices east of Mississippi are 2c. a lb. higher; west of Mississippi 3c. higher.

Inserts of WEAR-RESISTANT KENNAMETAL CAN OFTEN SALVAGE EXPENSIVE PARTS . . .

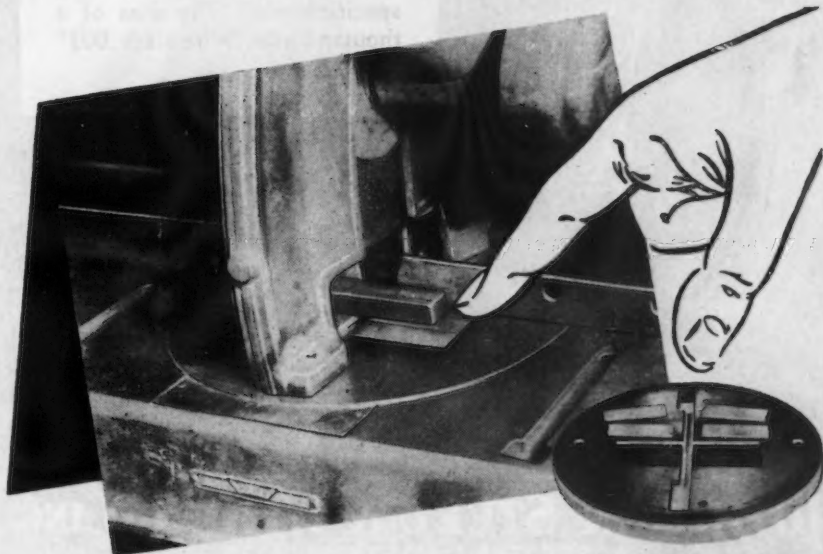


Table of abrasive cut-off saw recessed for Kennametal inserts

... AND PROVIDE A NEW SURFACE THAT OUTWEARS THE ORIGINAL UP TO 100 TIMES

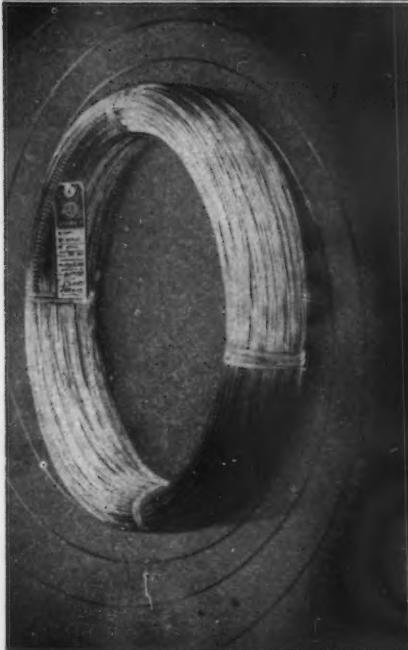
The effective life of many types of machines can be lengthened, and costly shutdowns eliminated, by using Kennametal at strategic points. The illustrations of the abrasive cut-off saw clearly show how standard Kennametal blanks, made primarily for cutting tools, can be used as wear-resistance units. The original surfaces of the saw rest wore quickly, allowing the steel to wobble, causing uneven cut-off. Kennametal inserts, recessed into the table, make a smooth, hard surface of unsurpassed durability.

● The superiority of Kennametal for "specialty" applications comes from a combination of unique properties—amazing hardness (78 Rockwell C), low coefficient of friction, high modulus of elasticity (2 to 3 times that of steel), dimensional stability, and resistance to corrosion and erosion.

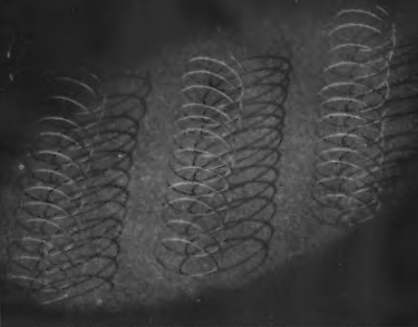
Kennametal is available in standard shapes (flat blanks, discs, balls), or it can be accurately molded into special shapes, limited only by reasonable proportions. You can use it profitably in your products, and production machinery. Tell us your wear problem. We will suggest how it may be solved with Kennametal.



JOHNSON XLO *Music Wire*



From the first step in its manufacture to its gleaming finish, Johnson XLO Music Wire is under constant laboratory control, meeting the most exacting specifications. The wire of a thousand uses. Wire sizes .003" to .200" dia.



JOHNSON STEEL & WIRE CO., INC.
WORCESTER 1, MASSACHUSETTS.

NEW YORK ATLANTA AKRON CHICAGO LOS ANGELES

FOR ALL TYPES of INDUSTRIAL FURNACES

You get efficient combustion
using LIGHT or HEAVY Fuel Oil

with this
**LOW AIR
PRESSURE
Oil Burner**

The Type LAP National Airol Burner is of simple yet rugged construction and has a versatility that makes it particularly suited for firing, forging, heat treating and other metal working furnaces. A wide operating range, freedom from clogging are two of its other desirable features. The LAP can be supplied in six sizes, with capacities up to 100 gals. per hour for manual or automatic control. Our Bulletin 65 gives full details . . . send for a copy.



Another National Airol Burner



Cross Section
of Type SA
Oil Burner

**NATIONAL AIROIL BURNER
COMPANY, INCORPORATED**

1271 East Sedgley Ave., Philadelphia 34, Pa.
ESTABLISHED 1912 INCORPORATED 1917

**NATIONAL
AIROIL
FUEL OIL - GAS
BURNERS**

Steam Atomizing Oil Burners—Mechanical Pressure Atomizing Oil Burners—Low Air Pressure Oil Burners—Motor-driven Rotary Oil Burners—Industrial Gas Burners—Combination Gas and Oil Burners—Fuel Oil Pumping Units—Fuel Oil Heaters—Fuel Oil Strainers and other accessories.

PRICES

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills
(F.o.b. Pittsburgh only on wrought pipe)
Base Price—\$200.00 per Net Ton

Steel (Butt Weld)

	Black	Galv.
1/2 in.	63 1/2	51
3/4 in.	66 1/2	55
1 to 3 in.	68 1/2	57 1/2

Wrought Iron (Butt Weld)

1/2 in.	24	3 1/2
3/4 in.	30	10
1 and 1 1/4 in.	34	16
1 1/2 in.	38	18 1/2
2 in.	37 1/2	18

Steel (Lap Weld)

2 in.	61	49 1/2
2 1/2 and 3 in.	64	52 1/2
3 1/2 to 6 in.	66	54 1/2

Wrought Iron (Lap Weld)

2 in.	30 1/2	12
2 1/2 to 3 1/2 in.	31 1/2	14 1/2
4 in.	33 1/2	18
4 1/2 to 8 in.	32 1/2	17

Steel (Butt, extra strong, plain ends)

1/2 in.	61 1/2	50 1/2
3/4 in.	65 1/2	54 1/2
1 to 3 in.	67	57

Wrought Iron (Same as Above)

1/2 in.	25	6
3/4 in.	31	12
1 to 2 in.	38	19 1/2

Steel (Lap, extra strong, plain ends)

2 in.	59	48 1/2
2 1/2 and 3 in.	63	52 1/2
3 1/2 to 6 in.	66 1/2	56

Wrought Iron (Same as Above)

2 in.	33 1/2	15 1/2
2 1/2 to 4 in.	39	22 1/2
4 1/2 to 6 in.	37 1/2	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card. F.o.b. Gary prices are two points lower discount or \$4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or \$2 a ton higher on all butt weld.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago . . .	\$54.80
6-in. and larger, del'd New York . .	52.20
6-in. and larger, Birmingham . . .	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles . . .	69.40
6-in. and larger f.o.b. cars, Seattle . .	71.20
Class "A" and gas pipe, \$3 extra; 4-in. pipe is \$3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are \$45 at Birmingham and \$53.80 delivered Chicago, \$59.40 at San Francisco and Los Angeles, and \$70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.	

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes, Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

	Seamless	Lap Weld
	Cold Drawn	Hot Rolled
2 in. o.d. 13 B.W.G. 15.03	13.04	12.38
2 1/2 in. o.d. 12 B.W.G. 20.21	17.54	16.58
3 in. o.d. 12 B.W.G. 22.48	19.50	18.35
3 1/2 in. o.d. 11 B.W.G. 28.37	24.62	23.15
4 in. o.d. 10 B.W.G. 35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft., and over	Base
30,000 lb. or ft. to 39,999 lb. or ft. . .	5%
20,000 lb. or ft. to 29,999 lb. or ft. . .	10%
10,000 lb. or ft. to 19,999 lb. or ft. . .	20%
5,000 lb. or ft. to 9,999 lb. or ft. . .	30%
2,000 lb. or ft. to 4,999 lb. or ft. . .	45%
Under 2,000 lb. or ft.	65%

PRICES

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points	Pacific Coast Basing Points†
Standard wire nails....	\$2.55	\$3.05
Coated nails	2.55	3.05
Cut nails, carloads....	3.85	.....
Annealed fence wire....	\$3.05	\$3.55
Annealed galv. fence wire	3.40	3.90
Woven wire fence*	\$0.67	\$0.85
Fence posts, carloads..	.69	.86
Single loop bale ties ..	.59	.84
Galvanized barbed wire**	.70	.80
Twisted barbless wire..	.70	.....

*15 1/2 gage and heavier. **On 80-rod spools in carload quantities.

†Prices subject to switching or transportation charges.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

Base discount less case lots

	Per Cent Off List
1/2 in. & smaller x 6 in. & shorter...	65 1/2
3/16 & 1/2 in. x 6 in. & shorter.....	63 1/2
3/4 to 1 in. x 6 in. & shorter.....	61
1 1/4 in. and larger, all lengths.....	59
All diameters over 6 in. long.....	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:

(Hexagon or Square)

1/2 in. and smaller	62
3/16 to 1 in. inclusive.....	59
1 1/4 to 1 1/2 in. inclusive.....	57
1 1/2 in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts U.S.S. S.A.E.

Base discount less keg lots

7/16 in. and smaller	64
1/2 in. and smaller	62
3/4 in. through 1 in.....	60
3/16 in. through 1 in.....	59
1 1/4 in. through 1 1/2 in.....	57
1 1/2 in. and larger	56

In full keg lots, 10 per cent additional discount.

Stove Bolts

Consumer

Packages, nuts loose	71 and 10
In packages, with nuts attached....	71
In bulk	80

On stove bolts freight allowed up to 65c per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets

(1/2 in. and larger)

Base per 100 Lb.

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	\$3.75
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Small Rivets

(7/16 in. and smaller)

Per Cent Off List

F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5
---	----------

Cap and Set Screws

Consumer

Per Cent Off List

Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.....	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes....	36
Fillister head cap, listed sizes	51

Freight allowed up to 65c per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in	20x28 in.
2-lb. coating I.C....	\$6.00	\$12.00
15-lb. coating I.C....	7.00	14.00
20 lb. coating I.C....	7.50	15.00

ERIE BUCKETS



THE COMPLETE LINE

Write for Data

Above types built in weights and capacities to suit your crane and job requirements.

ERIE STEEL CONSTRUCTION CO.

ERIE, PENNSYLVANIA

Aggre Meters • Buckets • Concrete Plants • Traveling Cranes

MACHINED BRONZE BEARINGS GRAPHITED AND OILLESS BRONZE BEARINGS BRONZE GEAR BLANKS MACHINED BRONZE PARTS

S & H Bronze Bearings are made of cast bronze, under the most modern conditions and of specifications to meet the most exacting requirements. We are manufacturers of plain bronze and graphited and oilless bronze bearings for all branches of the Government Services, as well as plain cylinder type, single and double flange, thrust washers, from 1/2" in diameter to 20" in diameter. We also manufacture special parts made of cast bronze. Our manufacturing methods and equipment enable us to meet the most exacting machining specifications.

If it's Bronze



We make it

INDUSTRIAL

BEARINGS

S. & H. Bearing and Manufacturing Co.

340-344 North Avenue, East

Cranford

New Jersey

PRICES

PIG IRON

All prices set in bold face type are maximum established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maximum. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phosphorus	Charcoal
Boston	\$25.50	\$25.00	\$26.50	\$26.00		
Brooklyn	27.50	27.00		28.00		
Jersey City	26.53	26.03	27.53	27.03		
Philadelphia (4)	25.84	25.34	26.84	26.34	\$30.74	
Bethlehem, Pa.	25.00	24.50	26.00	25.50		
Everett, Mass.	25.00	24.50	26.00	25.50		
Swedeland, Pa.	25.00	24.50	26.00	25.50		
Steelton, Pa.		24.50			\$29.50	
Birdsboro, Pa. (3)	25.00	24.50	26.00	25.50	29.50	
Sparrows Point, Md.	25.00	24.50				
Erie, Pa.	24.00	23.50	25.00	24.50		
Neville Island, Pa.	24.00	23.50	24.50	24.00		
Sharpville, Pa. (1)	24.00	23.50	24.50	24.00		
Buffalo	24.00	23.00	25.00	24.50	29.50	
Cincinnati, Ohio	25.11	24.61		25.11		
Canton, Ohio	25.39	24.89	25.89	25.39	32.69	
Mansfield, Ohio	25.94	25.44	26.44	25.94	32.86	
St. Louis	24.50	24.50				
Chicago	24.00	23.50	24.50	24.00	35.46	\$37.34
Granite City, Ill.	24.00	23.50	24.50	24.00		
Cleveland	24.00	23.50	24.50	24.00	32.42	
Hamilton, Ohio	24.00	23.50		24.00		
Toledo	24.00	23.50	24.50	24.00		
Youngstown	24.00	23.50	24.50	24.00	32.42	
Detroit	24.00	23.50	24.50	24.00		
Lake Superior fc.						34.00
Lyles, Tenn. (c. 2)						33.00
St. Paul	26.63	26.13	27.13	26.63	39.80	
Duluth	24.50	24.00	25.00	24.50		
Birmingham	20.38	19.00	25.00			
Los Angeles	26.95					
San Francisco	26.95					
Seattle	26.95					
Provo, Utah	22.00	21.50				
Montreal	27.50	27.50		28.00		
Toronto	25.50	25.50		26.00		

GRAY FORGE IRON: Valley or Pittsburgh furnace. \$23.50

(1) Pittsburgh Coke & Iron Co. (Sharpsville, Pa., furnace only) and the Struthers Iron & Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable. Struthers Iron & Steel Co. may add another \$1.00 per gross ton for iron from Struthers, Ohio, plant.

(2) Price shown is for low-phosphorus iron; high phosphorus sells for \$28.50 at the furnace.

(3) E. & G. Brooke Co., Birdsboro, Pa., permitted to charge \$1.00 per ton extra.

(4) Pittsburgh Ferromanganese Co. (Chester furnace only) may charge \$2.25 a ton over maximum basing point prices.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, \$2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and \$1 per ton extra for each additional 0.25 per cent nickel.

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, c. per lb., ton lots.

Copper, electrolytic, 150 and 200 mesh 21½ to 23½c.

Copper, reduced, 150 and 200 mesh 20½ to 25½c.

Iron, commercial, 100 and 200 mesh 96 + % Fe 13½ to 15c.

Iron, crushed, 200 mesh and finer, 90 + % Fe, carload lots 4c.

Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe, drum lots 63c.

Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe 30 to 33c.

Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe 42c.

Iron, carbonyl, 300 mesh and finer, 98-99.8 + % Fe 90c.

Aluminum, 100 and 200 mesh..*23 to 27c.

Antimony, 100 mesh 20.6c.

Cadmium, 100 mesh \$1.

Chromium, 150 mesh \$1.03

Lead, 100, 200 & 300 mesh, 11½ to 12½c.

Manganese, 150 mesh 51c.

Nickel, 150 mesh 51½c.

Solder powder, 100 mesh, 8½c. plus metal

Tin, 100 mesh 58½c.

Tungsten metal powder, 98%-99%, any quantity, per lb. \$2.60

Molybdenum powder, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb. \$2.60

Under 100 lb. \$3.00

*Freight allowed east of Mississippi.

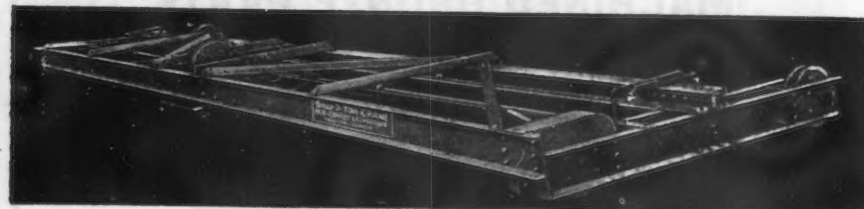
COKE

Furnace, beehive (f.o.b. oven)	Net Ton
Connellsville, Pa.	\$7.00*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	8.25
Foundry, By-Product	
Chicago, del'd 13.35	
Chicago, f.o.b. 12.60	
New England, del'd 14.25	
Kearny, N. J., f.o.b. 12.65	
Philadelphia, del'd 12.83	
Buffalo, del'd 13.00	
Portsmouth, Ohio, f.o.b. 11.10	
Painesville, Ohio, f.o.b. 11.75	
Erie, del'd 12.75	
Cleveland, del'd 12.80	
Cincinnati, del'd 12.85	
St. Louis, del'd 13.85	
Birmingham, del'd 10.50	

*Hand drawn ovens using trucked coal permitted to charge \$7.75 per ton plus transportation charges.

CONCO 3-Motor Single Girder CAB OR FLOOR OPERATED

ELECTRIC CRANE ...



Available in capacities of one through five tons for floor or cab operation. Simply, ruggedly designed for low first cost and maintenance. Used with Low Headroom Type Hoist, provides for maximum space coverage horizontally and vertically. Effective in even a minimum space. Write for Bulletin 2000.

Write for Bulletin 26000 describing the Torpedo Hoist shown. Three capacities 250 lb. — \$139.50, 500 lb. — \$149.50, 1000 lb. — \$159.50. Heavily, simply built, with Push Button Control. Outstanding in CONCO'S complete line of hand-powered and electric Cranes, Hoists, Trolleys.



CONCO ENGINEERING WORKS

Div. of H. D. Conkey & Co. — 15 Grove St. — Mendota, Ill.

Builders Of Conco Torpedo Electric Hoist

PRICES

REFRACTORIES

(F.o.b. Works)

Fire Clay Brick

	Per 1000
Super-duty brick, St. Louis	\$64.60
First quality, Pa., Md., Ky., Mo., Ill.	51.30
First quality, New Jersey	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	46.55
Sec. quality, New Jersey	51.00
No. 1 Ohio	43.00
Ground fire clay, net ton	7.60

Silica Brick

Pennsylvania and Birmingham	\$51.30
Chicago District	58.90
Silica cement, net ton (Eastern)	9.90

Chrome Brick

	Per Net ton
Standard chemically bonded, Balt., Plymouth Meeting, Chester	\$54.00

Magnesite Brick

Standard, Balt. and Chester	\$76.00
Chemically bonded, Baltimore	65.00

Grain Magnesite

Domestic, f.o.b. Balt. and Chester in sacks (carloads)	\$43.48
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

RAILS, TRACK SUPPLIES

(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	\$40.00
Angle splice bars, 100 lb.	2.70
(F.o.b. Basing Points)	Per Gross Ton
Light rails (from billets)	\$40.00
Light rails (from rail steel)	39.00
Base per Lb.	
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plate, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5
Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.	

CORROSION AND HEAT-RESISTING STEEL

(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

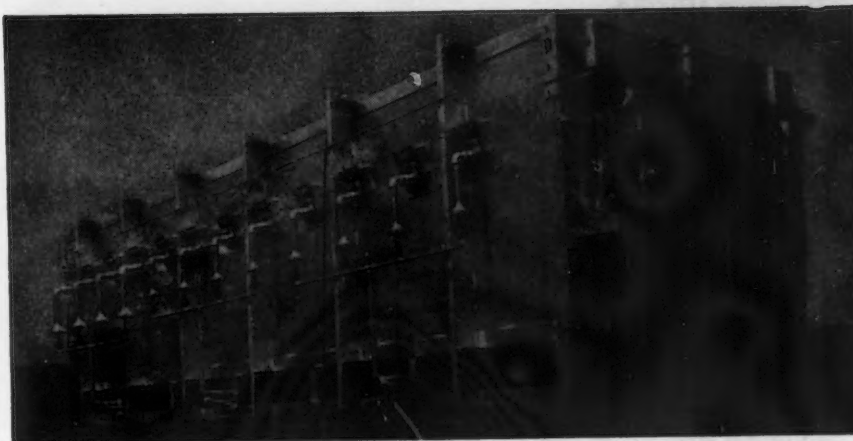
	No. 304
Plates	18.00c.*
Sheets	19.00c.*

*Includes annealing and pickling.

ELECTRICAL SHEETS

(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.
F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.	



BELLEVUE FURNACES

are designed for the job.

In the construction of Bellevue Furnaces, painstaking consideration of the job to be done comes first. Every factor must be evaluated, every condition studied. Only then do Bellevue engineers attempt design and recommendation of furnace type.

The soundness of that policy is being demonstrated in plant after plant. Hundreds of executives in scores of varied companies have proved, to their own satisfaction, the efficiency, speed, high production level and operating economies of Bellevues that were "designed" for the job.

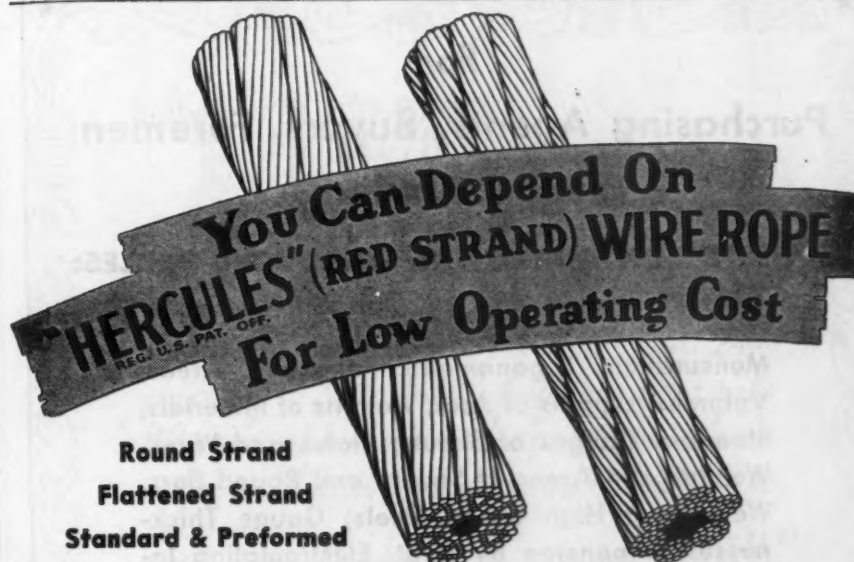
You, too, will find Bellevue experience and facilities a profitable investment for your own furnace needs.

Send for full details.

BELLEVUE INDUSTRIAL FURNACE CO.

2974 BELLEVUE AVENUE

DETROIT, MICH.



WHY not let "HERCULES" (Red-Strand) Wire Rope help you meet present day production requirements and still maintain a reasonable margin of profit? You will quickly discover that "HERCULES" is a dependable ally—not only in today's fight against increasing operating costs—but also in your endeavor to speed up production.

Made Only By **A. LESCHEN & SONS ROPE CO.** Established 1857

5909 Kennerly Avenue, St. Louis 12, Mo.

New York • Chicago • Denver • San Francisco • Seattle • Portland



Best! FOR LIGHT DUTY Speed!

**High Speed at Low Cost
No. 4B**

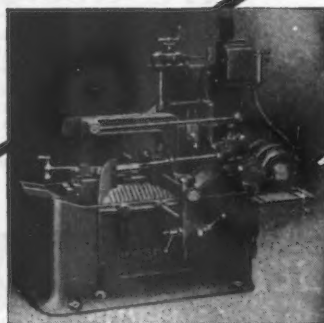
For tool room, stock room, or maintenance shop, this 6" x 6" capacity saw is superior to anything in its price class. Embodies features of MARVEL Heavy Duty production saws. Cuts a 2" standard pipe in 30 seconds—a 5" round piece of machine steel in 8 minutes!

MARVELSAWS

2-Speed and 4-Speed
For applications where materials of different hardnesses and alloy characteristics are to be cut, MARVEL 4B is available in 2-Speed and 4-Speed models. Built-in tracks for holding outer end of bars are also available for all models.

Complete Range of Metal Sawing Machines
Being the largest exclusive manufacturer of metal sawing machines and blades, both hack saw and band saw type, we have the correct answer to your cut-off problems. Each MARVEL model has a distinct application, so write us and we will send our catalog, price, and recommendation for the saw to fit your requirements most efficiently. MARVEL sawing engineers are also available to discuss and analyze your cut-off work. (Without obligation of course.)

ARMSTRONG-BLUM MFG. CO.
5700 W. Bloomingdale Ave., Chicago 39, Illinois, U.S.A.



For Purchasing Agents, Buyers, Foremen, Superintendents

A BOOK CONTAINING THE FOLLOWING TABLES:

(Size 5 1/2 x 8 1/2)

Mensuration, Trigonometric Functions, Areas, Volumes, Lengths of Arcs, Weights of Materials, Standard Gauges of Sheets, Plates and Wires, Weights and Areas of Square and Round Bars, Weights of High Speed Steels, Gauge Thicknesses, Expansion by Heat, Electroplating Information, Color Codes for Steel, Machineability Ratings, Hardness Conversion Charts, Cutting Speeds, etc.

Send your request to

GENERAL REFINERIES, INC.

27 NORTH 4TH STREET, MINNEAPOLIS 1, MINN.

P. O. BOX 1124

PRICES

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Bethlehem, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.
Carload lots (bulk) \$135.00
Carload lots (packed) 141.00
Less ton lots (packed) 148.50
Premium, \$1.70 for each 1% above 82% Mn; penalty, \$1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.
96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.
Carload, bulk 36c.
L.c.l. lots 38c.
95-97% Mn, .2% max. C, 1.5% max. Si, 2.5% max. Fe.
Carload, bulk 34c.
L.c.l. lots 35c.

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.
16-19% Mn 19-21% Mn
3% max. Si 3% max. Si
Carloads \$35.00 \$36.00
Less ton 47.50 48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carlots, f.o.b. shipping point with freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
50% Si ...	6.65c.	7.10c.	7.25c.
75% Si ...	8.05c.	8.20c.	8.75c.
80-90% Si ...	8.90c.	9.05c.	9.55c.
90-95% Si ...	11.05c.	11.20c.	11.65c.
Spot sales add: 45c. per lb. for 50% Si, .3c. per lb. for 75% Si, .25c. per lb. for 80-90% and 90-95% Si.			

Silvery Iron

(C/L, Per Gross Ton, base 6.00 to 6.50 \$)
F.o.b. Jackson, Ohio \$29.50*
Buffalo 30.75*
For each additional 0.50% silicon add \$1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add \$1 a ton for 0.75% phosphorous or over.
*OPA price established 6-24-41.

Bessemer Ferrosilicon

Prices are \$1 a ton above silvery iron quotations of comparable analysis.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for L.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe.	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe.	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk.	3.35c.	3.50c.	3.65c.
2000 lb.-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.
Carload, bulk 6.05c.
2000 lb. to carload 6.70c.
Under 2000 lb. 6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb. ... 5.80c.
2000 lb. to carload 6.30c.
Less ton lots 6.55c.

Ferrochrome

(65-72% Cr, 2% max. Si)
OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10% C	13.00c.	13.40c.	14.00c.

PRICES

Other Ferroalloys

Ferrotungsten, Standard grade, lump or $\frac{1}{4}$ X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungsten, 10,000 lb. or more....	\$1.90
Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. contained Va.	
Open hearth	\$2.70
Crucible	\$2.80
Primos	\$2.90
Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal.....	\$1.50
Vanadium pentoxide, 88%-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5 . Spot sales add 5c. per lb. contained V_2O_5	\$1.10
Ferroboreon, contract basis, 17.50% min., Bo, f.o.b. producer's plant with usual freight allowances, per lb. of alloy.....	
2000 lb. to carload.....	\$1.20
Under 2000 lb.	1.30
Silicaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)	
Carload lots	25c.
2000 lb. to carload.....	26c.
Silicaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)	
Carload lots	58c.
2000 lb. to carload.....	59c.
Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis	
No. 1	\$7.5c.
No. 6	60c.
No. 79	45c.
Borfram, f.o.b. Niagara Falls	
Ton lots, per lb.....	45c.
Less ton lots, per lb.....	50c.
Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.	
2000 lb. lots.....	\$2.25
Under 2000 lb. lots.....	\$2.30
Ferrotitanium, 40%-45% 0.10%C. max. f.o.b. Niagara Falls, N. Y., ton lots, per lb. contained Ti.....	\$1.23
Less ton lots	\$1.25
Ferrotitanium, 20%-25%, 0.10%C. max., ton lots, per lb. contained titanium	\$1.35
Less ton lots	\$1.40
High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per carload.....	\$142.50
Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with \$3 unitage freight equalized with Rockdale, Tenn., per gross ton.....	\$53.50
Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., \$3 unitage freight equalized with Nashville, per gross ton	\$75.00
Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo.	95c.
Calcium molybdate, 40%-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo.	80c.
Molybdenum oxide briquettes, 48%-52% Mo, f.o.b. Langeloth, Pa., per lb. contained Mo.....	80c.
Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo.....	80c.
Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add $\frac{1}{4}$ c. for spot sales	
Carload lots	14c.
Zirconium, 12-15%, contract basis, lump f.o.b. plant usual freight allowances, per lb. of alloy	
Carload, bulk	4.6c.
Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk	5.75c.
Ton lots	7.25c.
Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.	8.75c.
Car lots	9.25c.
Ton lots	

Stacking materials with
Clark Fork Trucks
to ceiling height saves floor space.

Moving materials with Clark Fork Trucks cuts cost—saves time. Up to 100 tons per hour can be moved!

"Unskilled labor adds nothing to a product except cost."
Ezra W. Clark

CLARK TRUCTRATOR
BATTLE CREEK, MICHIGAN, U.S.A.

"100%" ... that's what many people call the springs we make...including a certain branch of our military forces. Sometimes we may drop to 99%... or possibly a little less... but then we're only 99 years old...and we've got a lot to learn...but we'll keep trying because we want to be

"Everybody's Spring Dept."

DUNBAR BROTHERS CO.
DIV. OF ASSOCIATED SPRING CORP.
BRISTOL, CONN.

SPRINGS • WIRE FORMS • SMALL STAMPINGS

This advertisement is one of a series which is appearing in national magazines and newspapers as Consolidated Vultee's contribution toward a clearer public understanding of transportation's role in the war, and its postwar opportunities and responsibilities.

To Australia—AND BACK— in 95 hours and 20 minutes!



1. 12:00 midnight Sunday: A huge Liberator Express, loaded with a secret cargo, roars down its California runway and soon dwindles to a speck on the horizon. The dispatcher checks off another routine flight for CONSAIRWAY, the military airline established in 1942 by Consolidated for the Air Transport Command.



2. 10:30 p. m. Tuesday: The ground crew at an Australian airport speedily unloads the Liberator's high-priority cargo... checks the engines... heaves aboard tons of mail for the U. S. A. A new "Pony Express" flight crew jogs out, climbs aboard, and the giant transport streaks down the runway for the return trip.



4. So far, CONSAIRWAY Liberators have made 1764 round trips between the U. S. and Australia—a total of 25,900,000 over-water miles, without a single fatal accident. The original Liberator that pioneered the Australia run has now completed 84 round trips and is still going strong!



5. Born of war, CONSAIRWAY's job, in the beginning, was to bring back Ferry pilots who had delivered bombers to the South Pacific. Westbound cargoes, today as then, consist of tons of spare aircraft engines and parts, medical supplies, and ammunition—in short, any supplies that are needed fast by our fighting men "Down Under."

CONSOLIDATED VULTEE AIRCRAFT